Fall 2009 Human-Instructable Computing Wizard of OZ Studies

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23 February 2010

Abstract

The following report summarizes the series of Bootstrapped Learning "Wizard of OZ" studies conducted by the LEARN Lab in the Fall of 2009. The studies investigated how humans tend to naturally instruct what they believe is an electronic student. The studies included two domains: Wubble World and Charlie the Robot. The domains and experiment protocols are described, along with a sample of some of the transcripts collected. These studies were conducted as part of the work for the DARPA Bootstrapped Learning Program.

Contents

1 Introduction

The University of Arizona Wizard of Oz (WOZ) studies are intended to approximate the conditions that we believe might be in place during the field instruction of a capable electronic student.

This study complements the lessons learned from the previous BL human teacher study:

Dewayne E. Perry (University of Texas at Austin), Report for the Human Teacher Study, September 30, 2008, BAE Systems TR-2317

In Dr. Perry's study, transcripts were collected of the interaction between a human teacher and a human serving as the interface between the teacher and the Summer 2008 version of the Mable electronic student. A key observation of the dialogue Dr. Perry's study captured is that as soon as the teacher recognized that Mable is limited in the kind of instruction it can accommodate, s/he tended to reduce instruction to a style more like direct programming than natural instruction (even by BL NIM standards). This pattern was observed in all of the transcripts collected.

This provides a key motivation for the design of the WOZ scenarios in the present study: to provide human teachers a high degree of freedom in how they choose to instruct the student while believing they are interacting with a capable student. In order to approximate a capable electronic student, we had human subjects play the role of the student. While the full capabilities of an adult human student is beyond what we will likely achieve in the next decade, this does provide an important target for the kinds of interface and dialogue management we will eventually want to accommodate.

Our goal is to identify the instruction methods that human instructors use in these conditions, in order to compare with the existing BL NIM dimensions, and to define *relaxation trajectories* to move toward flexible field instructability that will be natural to average human users.

In the following sections we describe the various conditions we set up to elicit instruction and provide the transcripts of the dialogue between the teacher and student.
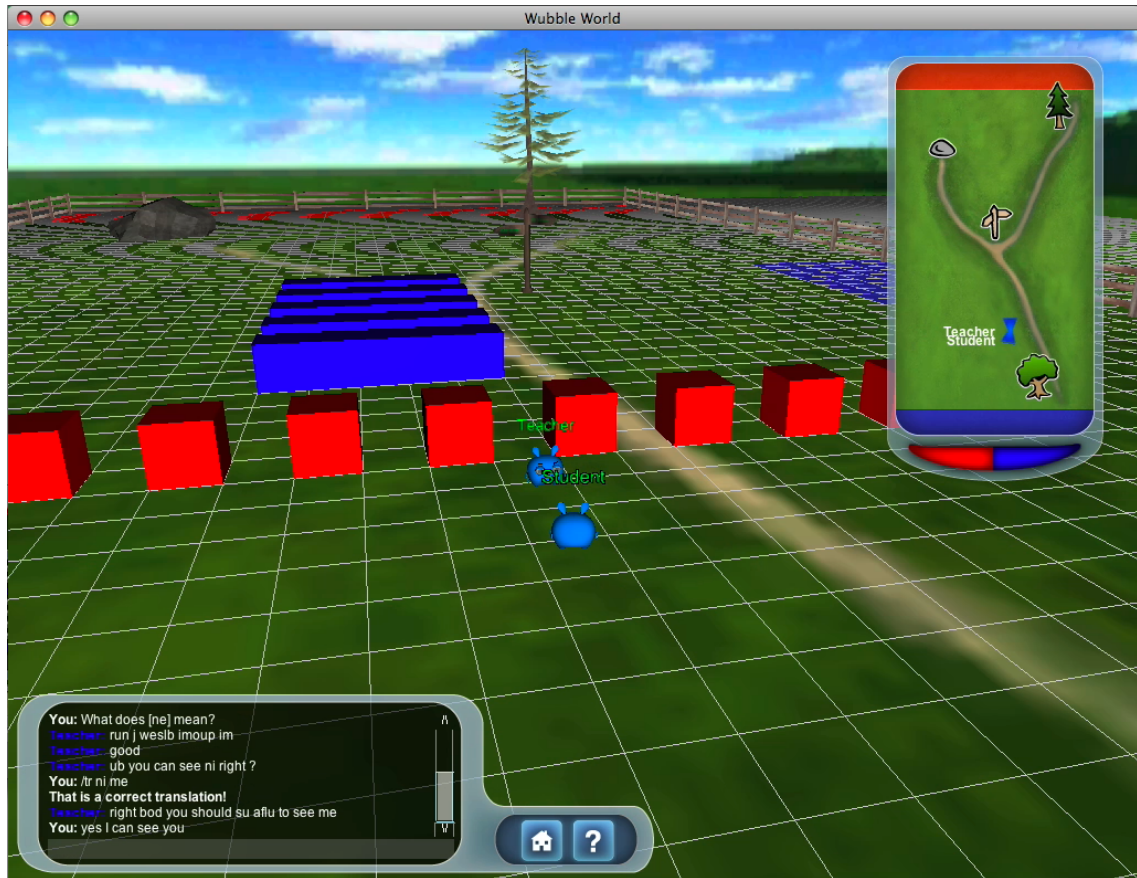
Figure 1: Student wubble interface view

2   WubbleWorld 3D WOZ transcripts

WubbleWorld (ww3d) is a 3D simulated environment in which agents called *wubbles* are able to move around and manipulate objects. We adapted ww3d so that humans can control the wubbles and communicate using a peer-to-peer chat facility. Figure 1 shows the Student wubble's interface view, and Figure 2 shows the Teacher's interface. The two figures show what the Student and Teacher are seeing from their perspective, at the same moment in time in the same environment.

2.1   WW3D General Protocol

One subject is the *Teacher*, the other the *Student*. Both Teacher and Student do not know ahead of time what the teaching/learning task is or what the goals of the Boostrapped Learning program are.

The Teacher is told s/he is interacting with an automated but intelligent agent (an
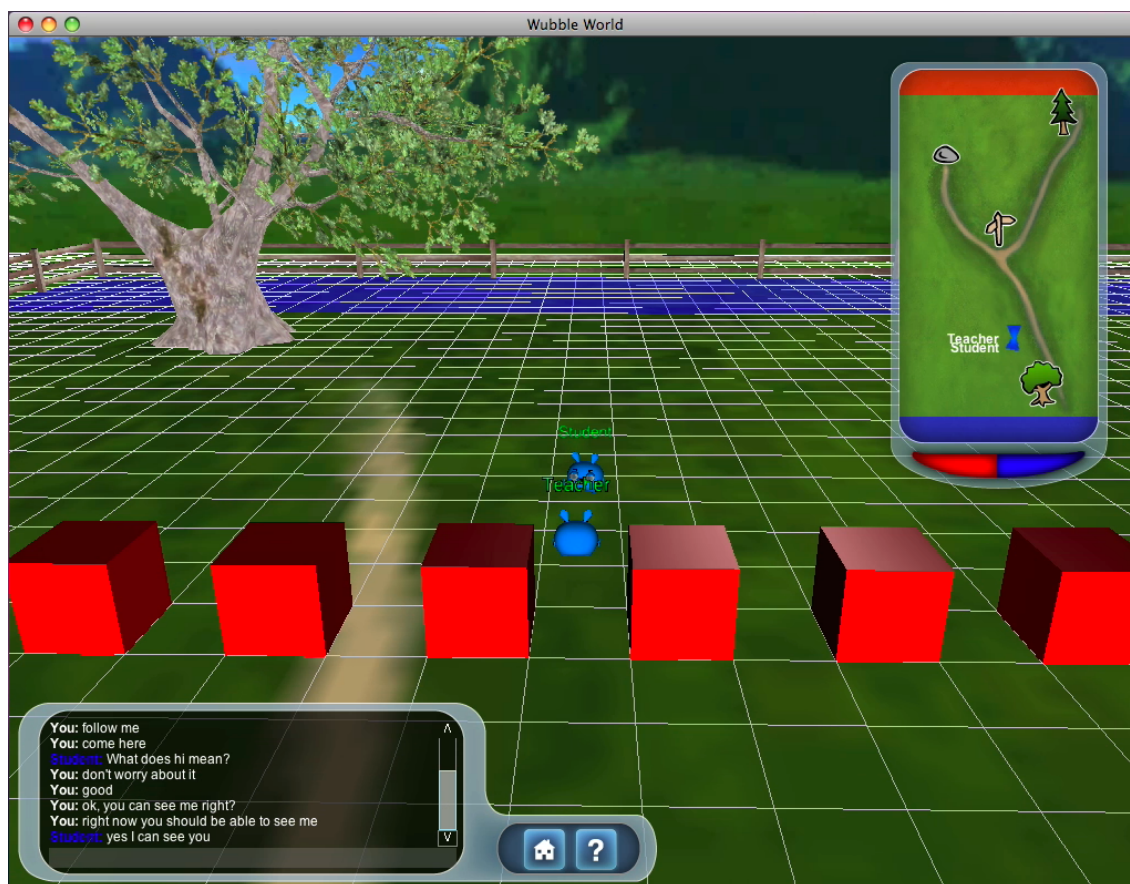
Figure 2: Teacher wubble interface view

'electronic student'); the Student is informed s/he is interacting with a human teacher. The subjects are set up in separate rooms with computers running the ww3d client and connected to the ww3d server. An experimenter is present in each room to help make sure things run smoothly. In order to protect our limited subject pool, we asked that all participants not discuss what they did during the experiment with other students who may participate.

2.1.1 Background: The Teaching Task

The purpose of the teaching task is to require that multiple concepts will have to be taught, some depending on first mastering others. At the same time, we do not want to bias any strategy the Teacher might naturally use to teach the Student. We also want the concepts taught to involve teaching of definitions, predicates (world states), and procedures that involve multiple steps, conditions and sub-goals.

The Wubble environment has two kinds of blocks: cube-shaped red blocks and

elongated blue blocks. The overall task is for the Teacher to teach the Student how to build a wall so that it can hide behind the wall, out of view of some other observer. This requires that the Student learn about the concept of "line of sight" and how building a wall will make it so someone behind the wall is not within line of sight. The wall must be at least two boxes high for the Observer to not see the Student. A "proper" wall has the longer blue boxes placed on top of red boxes. The Student is also expected to handle situations in which there may be multiple Observers in different positions. The Teacher is expected to verify that the Student has learned each of the concepts taught.

2.1.2   WW3D Interface Controls

A : Turn left
D : Turn right
W : Move forward
S : Move backward
SPACE-bar : Jump
Left click (Mac track pad button): Highlight block (both agents can see the highlight)
Right click (ctrl-click Mac track pad button): Pick up block; this causes the selected
    block to move to above the Wubble's head
P (while holding block): Enters the "place block" mode (move the mouse around and
    you will see the special block placement pointer); When in the mode, if you left
    click the mouse, the block will be placed in the world grid space where the pointer
    is currently pointing (the placement action tries to fit the block to the grid space)
R (while holding block): Rotate a held block 90 degrees (intended for use with the
    long blocks)
Q (while holding block): Just drop the block in the current grid space occupied by
    the Wubble (no fancy placement). In practice, this means the block drops onto
    the Wubble's head, and when the Wubble moves, the block falls to the ground.
/ : Takes you to the chat line to start entering text

2.1.3   Teacher Protocol

The Teacher is read the following
    You are going to be teaching some simple tasks to an automated student. The Student that you will be teaching does not know much about the world. The Student has a perceptual system that allows it to see from a perspective based on the direction it is facing. You can also communicate with the Student using a text interface, similar to a standard peer-to-peer chat interface.
    Your job is to teach the Student how to build a wall made out of boxes so that an Observer (which could be you) cannot see the Student behind the wall. This requires that the Student learn about the concept of "line of sight" and how building a wall will make it so that someone behind the wall is not within line of sight. The wall must be at least two boxes high for the Observer to not see the Student. There are two kinds of boxes that will be used to construct the wall: small, red boxes and large blue boxes.

Proper walls have red boxes forming the base with long blue boxes on top. The Student is also expected to handle situations in which there may be multiple Observers in different positions. You are expected to verify that the Student has learned the concepts taught.

The experimenter then describes the WW3D interface controls and the Teacher is provided 10 minutes to get comfortable with controlling the wubble avatar. During this time, the Student wubble avatar is not visible; only after practice are both wubble avatars placed in the same environment.

2.1.4   Student Protocol

The Student is read the following

You are going to be taught one or more concepts and tasks by a Teacher. Your job is to follow the Teacher's instructions in order to learn the concepts. You will also need to demonstrate that you have learned the concepts being taught.

The experimenter then describes the WW3D interface controls. When using the "text scrambler" condition, this included teaching the Student about the /tr translation facility. The Student is provided roughly 10 minutes to get comfortable with controlling the wubble avatar. During this time, the Teacher wubble avatar is not visible; only after practice are both wubble avatars placed in the same environment.

2.1.5   Free and Scrambled Text Conditions

We used two different conditions in the ww3d study:

1. "free text" condition: in this condition, all of the Teacher's input text is presented to the Student's chat interface in they way the Teacher wrote it.
2. "text scrambler" condition: a small lexicon of terms was defined by the experimenters; When the Teacher enters text that matches one of these terms, it will show up in the Student's chat box intact, otherwise the word's characters are scrambled using a method that maintains consonant and vowel location in the word, but is otherwise randomly generated. Scrambled words maintain a consistent spelling throughout the run: if "wall" is scrambled as "bilg", it will always show up as "bilg" any time the Teacher writes "wall". The Student is provided an interface in which they can guess what the word might mean. If they guess correctly, then from that point forward, the word will no longer be scrambled. The purpose of the "text scrambler" condition is to approximate the condition that the Student does not know many terms and must learn vocabulary as the dialogue unfolds.

The following words were used for the non-scrambled lexicon in the "text scrambler" condition: teacher, student, observer, as, a, the, of, to, yes, no, good, bad, and, or, not, pick, grab, put, move, choose, look, see, up, down, here, there, start, stop, new, I, you, we, lesson, box, can, cannot, do, like, would, should, want, please, goal, precondition, step, first, second, third, next, finally, cause, because, need, 1, 2, 3, one, two, three, left, right, side, front, back, top, bottom, in, out, outside, on, onto, end, line, more, less, another, close, near, far

2.2 WW3D WOZ Transcripts with Text Scrambler

The conditions under which the first three transcripts were collected included use of the Text Scrambler. In this condition, the Student's text entry interface included two additional functions:

1. The Student can type

   `/tr <scrambled-word> <hypothesized-translation>`.

   If the hypothesized-translation is in fact what the Teacher was writing, then the Student will be told the translation was successful and from then on the word will no longer be scrambled. Use of this facility in the transcripts is indicated by lines that start with `<TRANSLATE>`.

2. Students can also "quote" a single word by surrounding it by brackets:

   `[<scrambled-word>]`

   This scrambled word will show up unscrambled to the Teacher. This is so the Student can use the scrambled word when asking questions, but the Teacher (who doesn't know how their own words are scrambled) will understand what the Student is saying. For example, if the Teacher's word 'square' is scrambled as 'fliaty', like this:

   `put the fliaty in the inyews`

   the Student can then reply

   `I don't understand [fliaty]`

   and this will show up to the Teacher as

   `I don't understand square`

2.2.1 Transcript Format: scrambled text condition

The ww3d transcripts are in a lisp list format. The first element of the list is the number of the utterance (increments by 1 for each utterance throughout the transcript). The second element is the identity of the speaker: teacher or student. The third element is a list representing the utterance itself. In the case of Teacher utterances, this include TWO strings: the original string typed by the Teacher followed by the scrambled text string. In the case of the Student's utterance, there is just the original text and this is what the Teacher sees. The last two elements are numbers representing the internal time of when the teacher/student began typing and finally sent the text.

Except for the first transcript, punctuation has been uniformly replaced by the character '-'. This was done due to a technical issue in how the transcripts were being stored in the database. Note that punctuation was preserved during the session and this replacement only occurred as the text was saved to the database. It should be fairly easy to determine from context when question marks ('?') and periods ('.') were used.

2.2.2   ww3d - 24 September 2009, 1:50pm - scrambled

```
(id fluent_id value start_time end_time)
(0 teacher ("hello" "polly ") 171335.0 171338.0)
(1 student ("do you mean move?") 190182.0 190184.0)
(2 teacher ("we will learn to build a wall" "we zogh peurn to jiond a jurs ")
   191375.0 191377.0)
(3 student ("red?") 210817.0 210821.0)
(4 teacher ("yes" "yes ") 224314.0 224322.0)
(5 student ("this one?") 252035.0 252046.0)
(6 teacher ("yes" "yes ") 279577.0 279580.0)
(7 student ("what now?") 293336.0 293345.0)
(8 teacher ("return to me five grids" "zugons to ma jewe whors ")
   307563.0 307570.0)
(9 student ("put it on something?") 329528.0 329536.0)
(10 teacher ("backup 5 grids" "cebrag h whors ") 347727.0 347739.0)
(11 student ("<TRANSLATE> whors blue") 392235.0 392240.0)
(12 teacher ("come here" "nolo here ") 404557.0 404563.0)
(13 student ("<TRANSLATE> whors on") 408696.0 408702.0)
(14 teacher ("bring the block to me" "blags the ploms to ma ")
   418171.0 418182.0)
(15 student ("<TRANSLATE> blags bring") 439629.0 439632.0)
(16 teacher ("drop the block" "shor the ploms ") 469972.0 469980.0)
(17 student ("<TRANSLATE> shor all") 483955.0 483961.0)
(18 student ("<TRANSLATE> ploms blocks") 505071.0 505073.0)
(19 teacher ("put the block on the ground" "put the ploms on the staimp ")
   510912.0 510916.0)
(20 student ("<TRANSLATE> staimp fence") 562217.0 562229.0)
(21 student ("that one?") 600933.0 600938.0)
(22 teacher ("put the block next to the other one"
            "put the ploms next to the igrew one ")
   662521.0 662526.0)
(23 student ("<TRANSLATE> igrew left") 693921.0 693929.0)
(24 teacher ("no" "no ") 730927.0 730936.0)
(25 teacher ("put the block on the ground next to the other block"
            "put the ploms on the staimp next to the igrew ploms ")
   744315.0 744319.0)
(26 teacher ("watch me" "pocrn ma ") 752060.0 752065.0)
(27 teacher ("yes" "yes ") 765431.0 765438.0)
(28 teacher ("get onother block" "dak imoccur ploms ") 777814.0 777819.0)
(29 teacher ("no" "no ") 786934.0 786937.0)
(30 teacher ("yes" "yes ") 896272.0 896278.0)
(31 teacher ("yes" "yes ") 913322.0 913331.0)
(32 student ("a pile?") 968492.0 968503.0)
(33 teacher ("no" "no ") 976328.0 976336.0)
(34 teacher ("place the box next to another box"
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                "glepy the box next to another box ")
     989758.0 989765.0)
(35 teacher ("place the box next to mine" "glepy the box next to wiwi ")
     1081192.0 1081199.0)
(36 teacher ("yes" "yes ") 1099147.0 1099149.0)
(37 teacher ("get a blue box" "dak a trou box ") 1148416.0 1148422.0)
(38 teacher ("stack it on the reb boxes" "grelt ew on the map fedus ")
     1180213.0 1180222.0)
(39 teacher ("stack" "grelt ") 1223447.0 1223456.0)
(40 teacher ("stack the blue box on the red boxes"
                "grelt the trou box on the hul fedus ")
     1266318.0 1266331.0)
(41 student ("is my intention the right one-") 1302384.0 1302392.0)
(42 teacher ("yes" "yes ") 1307246.0 1307252.0)
(43 student ("waa") 1343016.0 1343024.0)
(44 teacher ("push the red blocks together" "kurt the hul bluppl ziwupsil ")
     1374288.0 1374295.0)
(45 student ("start over?") 1392650.0 1392655.0)
(46 teacher ("stack the blue box on the red boxes"
                "grelt the trou box on the hul fedus ")
     1580979.0 1580979.0)
(47 teacher ("stack the blue box on the red box"
                "grelt the trou box on the hul box ")
     1635568.0 1635572.0)
(48 teacher ("try again" "phl apeob ") 1670297.0 1670304.0)
(49 teacher ("put the red blocks next to each other"
                "put the hul bluppl next to oums igrew ")
     1837635.0 1837640.0)
(50 teacher ("yes" "yes ") 1921868.0 1921878.0)
(51 teacher ("more red blocks" "more hul bluppl ") 1927993.0 1927999.0)
(52 teacher ("good" "good ") 1999253.0 1999259.0)
(53 student ("more?") 2104617.0 2104621.0)
(54 teacher ("good" "good ") 2106898.0 2106904.0)
(55 teacher ("get another red block and place it next to the others"
                "dak another hul ploms and glepy ew next to the ossebs ")
     2122366.0 2122375.0)
(56 teacher ("stack the blue box" "grelt the trou box ") 2181981.0 2181986.0)
(57 teacher ("yes" "yes ") 2198617.0 2198624.0)
(58 teacher ("now stack the blue box" "ner grelt the trou box ")
     2205748.0 2205751.0)
(59 student ("here?") 2288658.0 2288664.0)
(60 teacher ("yes" "yes ") 2301291.0 2301301.0)
(61 teacher ("stop now" "stop ner ") 2311350.0 2311358.0)
(62 teacher ("yes" "yes ") 2341025.0 2341036.0)
(63 teacher ("stop now" "stop ner ") 2350763.0 2350767.0)
(64 student ("no more?") 2352714.0 2352717.0)
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(65 teacher ("no more" "no more ") 2357820.0 2357825.0)
(66 teacher ("get the blue block" "dak the trou ploms ") 2370569.0 2370573.0)
(67 student ("this?") 2380177.0 2380179.0)
(68 teacher ("yes" "yes ") 2387429.0 2387435.0)
(69 student ("i can't get it on top") 2395137.0 2395148.0)
(70 teacher ("stack the blue box on the red boxes"
            "grelt the trou box on the hul fedus ")
   2399907.0 2399914.0)
(71 student ("i can't") 2410479.0 2410483.0)
(72 teacher ("drop the blue box" "shor the trou box ")
   2417883.0 2417894.0)
(73 student ("rotate it?") 2429360.0 2429368.0)
(74 teacher ("try to stack the blue box" "phl to grelt the trou box ")
   2457448.0 2457454.0)
(75 teacher ("stack the blue box into the red boxes"
            "grelt the trou box ompy the hul fedus ")
   2483939.0 2483949.0)
(76 student ("next to?") 2511249.0 2511255.0)
(77 teacher ("come here please" "nolo here please ") 2516403.0 2516414.0)
(78 student ("leave it here?") 2529593.0 2529602.0)
(79 teacher ("can you see me?" "can you see ma ? ") 2535610.0 2535617.0)
(80 student ("yes") 2542686.0 2542693.0)
(81 teacher ("leave it there" "tiety ew there ") 2543785.0 2543791.0)
(82 teacher ("you are in my line of sight" "you odo in gr line of kigrt ")
   2570054.0 2570056.0)
(83 teacher ("can you see me?" "can you see ma ? ") 2593213.0 2593219.0)
(84 teacher ("you are not in my line of sight" "you odo not in gr line of kigrt ")
   2605229.0 2605231.0)
(85 student ("yes") 2605238.0 2605242.0)
(86 student ("ok") 2615486.0 2615490.0)
(87 teacher ("you can not see me because you are not in my line of sight"
            "you can not see ma because you odo not in gr line of kigrt ")
   2634408.0 2634416.0)
(88 teacher ("see me now?" "see ma ner ? ") 2652460.0 2652467.0)
(89 teacher ("can you see me now?" "can you see ma ner ? ") 2666893.0 2666900.0)
(90 teacher ("can you see me now?" "can you see ma ner ? ") 2697505.0 2697512.0)
(91 student ("should i?") 2705604.0 2705613.0)
(92 teacher ("yes" "yes ") 2711915.0 2711919.0)
(93 student ("i see your eyelids") 2718474.0 2718477.0)
(94 teacher ("good" "good ") 2723183.0 2723188.0)
(95 teacher ("you are in my line of sight?" "you odo in gr line of kigrt ")
   2732646.0 2732650.0)
(96 student ("you want me in your line of sight?") 2737496.0 2737503.0)
(97 teacher ("no" "no ") 2748755.0 2748762.0)
(98 student ("here?") 2780195.0 2780208.0)
(99 teacher ("no" "no ") 2795310.0 2795318.0)
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(100 teacher ("you are in my line of sight because you can see me"
               "you odo in gr line of kigrt because you can see ma ")
     2814214.0 2814216.0)
(101 teacher ("can you see me?" "can you see ma ? ") 2850138.0 2850140.0)
(102 student ("no") 2852531.0 2852541.0)
(103 teacher ("you are not in my line of sight"
               "you odo not in gr line of kigrt ")
     2863786.0 2863787.0)
(104 student ("should i be able to see you?") 2882196.0 2882200.0)
(105 teacher ("can you move to gewt in my line of sight?"
               "can you move to woms in gr line of kigrt ? ")
     2882469.0 2882479.0)
(106 teacher ("can you see me?" "can you see ma ? ") 2911045.0 2911054.0)
(107 student ("yes") 2915520.0 2915524.0)
(108 teacher ("you are now im my line of sight"
               "you odo ner ow gr line of kigrt ")
     2928759.0 2928764.0)
(109 student ("i'm near the gr line of kigrt") 2947407.0 2947416.0)
(110 teacher ("can you see me?" "can you see ma ? ") 2969186.0 2969192.0)
(111 student ("why do you keep hiding from me?") 2971946.0 2971949.0)
(112 student ("no") 2975937.0 2975946.0)
(113 teacher ("am I im your line of sight?" "ab i ow goit line of kigrt ? ")
     2990223.0 2990232.0)
(114 student ("i just saw your ear") 3014268.0 3014273.0)
(115 teacher ("yes" "yes ") 3029544.0 3029553.0)
(116 teacher ("I was in your line of sight" "i dun in goit line of kigrt ")
     3046331.0 3046337.0)
(117 teacher ("am I in your line of sight now?"
               "ab i in goit line of kigrt ner ? ")
     3057501.0 3057506.0)
(118 student ("do you want me on the diagonal?") 3104919.0 3104924.0)
(119 teacher ("can you see me?" "can you see ma ? ") 3177989.0 3177993.0)
(120 student ("yes") 3183099.0 3183109.0)
(121 teacher ("I am now in your line of sight"
               "i ab ner in goit line of kigrt ")
     3194505.0 3194508.0)
(122 teacher ("-") 3207948.0 3207950.0)
(123 student ("your are in the same line as me") 3207960.0 3207964.0)
(124 teacher ("yes" "yes ") 3216114.0 3216118.0)
(125 teacher ("are you in my line of sight?" "odo you in gr line of kigrt ? ")
     3254060.0 3254061.0)
(126 student ("i am in the same line as you") 3270345.0 3270347.0)
(127 teacher ("yes" "yes ") 3278697.0 3278702.0)
(128 teacher ("I am now in your line of sight"
               "i ab ner in goit line of kigrt ")
     3305052.0 3305057.0)
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(129 teacher ("am I in your line of sight?" "ab i in goit line of kigrt ? ")
         3332661.0 3332664.0)
(130 student ("you are not in the same line as me") 3338607.0 3338616.0)
(131 teacher ("true, can you see me?" "trey can you see ma ? ")
         3351805.0 3351812.0)
(132 student ("yup") 3359592.0 3359596.0)
(133 teacher ("then you are in my line of sight"
              "phib you odo in gr line of kigrt ")
         3369777.0 3369787.0)
(134 teacher ("I am in your line of sight" "i ab in goit line of kigrt ")
         3384433.0 3384439.0)
(135 student ("in the third line?") 3409026.0 3409031.0)
(136 student ("in the green") 3424966.0 3424968.0)
(137 teacher ("if you can see me then you are in line of sight"
              "ew you can see ma phib you odo in line of kigrt ")
         3467323.0 3467327.0)
(138 teacher ("can you see me?" "can you see ma ? ") 3510803.0 3510808.0)
(139 student ("yes") 3515487.0 3515491.0)
(140 teacher ("then you are in line of sight" "phib you odo in line of kigrt ")
         3524029.0 3524040.0)
(141 teacher ("am I in your line of sight?" "ab i in goit line of kigrt ? ")
         3559785.0 3559788.0)
(142 student ("this is ner line of kigrt") 3571098.0 3571102.0)
(143 teacher ("what did you say?" "tram cer you cet ? ") 3593487.0 3593492.0)
(144 student ("you are to my right") 3615669.0 3615675.0)
(145 teacher ("non" "mes ") 3632809.0 3632815.0)
(146 teacher ("no" "no ") 3634956.0 3634960.0)
(147 teacher ("do you see me?" "do you see ma ? ") 3669269.0 3669273.0)
(148 student ("yes") 3673465.0 3673473.0)
(149 student ("i can go to your line of kigrt") 3697206.0 3697217.0)
(150 teacher ("go to my line of sight" "vu to gr line of kigrt ")
         3718538.0 3718541.0)
(151 teacher ("are you there?" "odo you there ? ") 3730957.0 3730964.0)
(152 student ("yes") 3737104.0 3737110.0)
(153 teacher ("can you see me?" "can you see ma ? ") 3746859.0 3746866.0)
(154 student ("yes") 3750760.0 3750767.0)
(155 teacher ("then you are in line of sight" "phib you odo in line of kigrt ")
         3761464.0 3761467.0)
(156 teacher ("can you see me?" "can you see ma ? ") 3786590.0 3786596.0)
(157 student ("yes now") 3807340.0 3807348.0)
(158 teacher ("you are in line of sight" "you odo in line of kigrt ")
         3814889.0 3814899.0)
(159 teacher ("can you see me?" "can you see ma ? ") 3832261.0 3832268.0)
(160 student ("yes") 3834499.0 3834505.0)
(161 teacher ("you are in line of sight" "you odo in line of kigrt ")
         3842565.0 3842573.0)
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(162 student ("you are not on the same side of the path ")
     3864318.0 3864325.0)
(163 teacher ("can you see me?" "can you see ma ? ") 3873415.0 3873425.0)
(164 student ("yes, on the map") 3888356.0 3888363.0)
(165 student ("i just noticed the map") 3901462.0 3901473.0)
(166 teacher ("can you see me without using the map?"
               "can you see ma deploes efuss the gan ? ")
     3949046.0 3949050.0)
(167 student ("i can't see you on the grass") 3989742.0 3989744.0)
(168 teacher ("then i am not line of sight" "phib i ab not line of kigrt ")
     4007701.0 4007705.0)
(169 student ("i see you now") 4023164.0 4023176.0)
(170 teacher ("I am in line of sight" "i ab in line of kigrt ")
     4037638.0 4037647.0)
(171 student ("you are on my side of the path") 4037872.0 4037880.0)
(172 teacher ("yes" "yes ") 4045902.0 4045913.0)
(173 teacher ("turn to look at the tree" "rich to look ik the frou ")
     4061267.0 4061278.0)
(174 student ("<TRANSLATE> frou map") 4086085.0 4086092.0)
(175 teacher ("turn to the left and look at the tree"
               "rich to the left and look ik the frou ")
     4090654.0 4090657.0)
(176 student ("the path is there on my left") 4129657.0 4129661.0)
(177 teacher ("yes" "yes ") 4141217.0 4141221.0)
(178 teacher ("turn to the left" "rich to the left ") 4149000.0 4149011.0)
(179 teacher ("look to the left" "look to the left ") 4159895.0 4159900.0)
(180 student ("move to the left") 4160226.0 4160236.0)
(181 student ("ok") 4165067.0 4165069.0)
(182 teacher ("yes" "yes ") 4165430.0 4165433.0)
(183 teacher ("move more left" "move more left ") 4183840.0 4183852.0)
(184 teacher ("the tree is now line of sight" "the frou em ner line of kigrt ")
     4192039.0 4192047.0)
(185 teacher ("I am now line of sight" "i ab ner line of kigrt ")
     4240541.0 4240543.0)
(186 student ("you are near the path") 4258375.0 4258382.0)
(187 student ("near the line of kigrt") 4270292.0 4270302.0)
(188 teacher ("I am line of sight because you are looking at me"
               "i ab line of kigrt because you odo zeujuks ik ma ")
     4284508.0 4284520.0)
(189 teacher ("turn to look at me" "rich to look ik ma ") 4346196.0 4346205.0)
(190 student ("i should move closer to the line of kigrt") 4349530.0 4349534.0)
(191 teacher ("can you see me?" "can you see ma ? ") 4366586.0 4366588.0)
(192 student ("yes") 4370412.0 4370416.0)
(193 teacher ("I am in line of sight" "i ab in line of kigrt ")
     4379816.0 4379822.0)
(194 teacher ("am i line of sight?" "ab i line of kigrt ? ")
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    4406759.0 4406765.0)
(195 student ("you are not on the path") 4425153.0 4425162.0)
(196 student ("are you in line of kigrt?") 4437838.0 4437844.0)
(197 teacher ("no" "no ") 4443686.0 4443689.0)
(198 student ("now you are") 4478724.0 4478730.0)
(199 teacher ("I am now line of sight because you are looking at me"
             "i ab ner line of kigrt because you odo zeujuks ik ma ")
    4478795.0 4478797.0)
(200 teacher ("yes" "yes ") 4511847.0 4511851.0)
(201 teacher ("I am in line of sight because you can see me"
             "i ab in line of kigrt because you can see ma ")
    4523936.0 4523939.0)
(202 student ("you are in the same lineas me so you are ner line of kigrt")
    4530325.0 4530327.0)
(203 teacher ("am i line of sight now?" "ab i line of kigrt ner ? ")
    4576077.0 4576081.0)
(204 student ("no") 4600344.0 4600351.0)
(205 student ("now you are") 4621897.0 4621905.0)
(206 teacher ("yes" "yes ") 4634502.0 4634513.0)
(207 teacher ("is the tree line of sight?" "em the frou line of kigrt ? ")
    4649701.0 4649710.0)
(208 student ("no?") 4695352.0 4695361.0)
(209 teacher ("turn toput the tree line of sight"
             "rich mekok the frou line of kigrt ")
    4729985.0 4729991.0)
(210 teacher ("turn to put the tree line of sight"
             "rich to put the frou line of kigrt ")
    4742975.0 4742980.0)
(211 student ("now i am in frou line of kigrt") 4828573.0 4828579.0)
(212 student ("no") 4837405.0 4837407.0)
(213 teacher ("am i in line of sight?" "ab i in line of kigrt ? ")
    4885293.0 4885293.0)
(214 student ("yes") 4892561.0 4892570.0)
(215 teacher ("yes" "yes ") 4899498.0 4899504.0)
(216 teacher ("is the tree line of sight?" "em the frou line of kigrt ? ")
    4911294.0 4911302.0)
(217 student ("no") 4923716.0 4923722.0)
(218 teacher ("no" "no ") 4927710.0 4927712.0)
(219 teacher ("is the tree line of sight?" "em the frou line of kigrt ? ")
    4964990.0 4964998.0)
(220 student ("no") 4978740.0 4978742.0)
(221 teacher ("turn to face the tree" "rich to puje the frou ")
    4989143.0 4989148.0)
(222 student ("frou line of kigrt") 5093314.0 5093323.0)
(223 teacher ("i am line of sight" "i ab line of kigrt ")
    5182547.0 5182553.0)
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(224 student ("ok") 5196151.0 5196155.0)
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2.2.3 ww3d - 24 September 2009, 4:20pm - scrambled

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(id fluent_id value start_time end_time)
(0 teacher ("move forward" "move viffost ") 85315.0 85322.0)
(1 teacher ("move forward" "move viffost ") 109140.0 109146.0)
(2 student ("<TRANSLATE> viffost forward-") 114233.0 114241.0)
(3 student ("<TRANSLATE> viffost forward") 129858.0 129861.0)
(4 teacher ("observe teacher" "urridsy teacher ") 159910.0 159916.0)
(5 student ("tr urridsy follow") 184363.0 184367.0)
(6 teacher ("follow me" "mobbik ma ") 222480.0 222485.0)
(7 student ("I don-t understand what a -mobbik ma- is") 246354.0 246360.0)
(8 teacher ("stop" "stop ") 264932.0 264936.0)
(9 teacher ("grab selected block" "grab sajeksip ploms ") 287634.0 287641.0)
(10 student ("tr sajeksip red") 305149.0 305155.0)
(11 teacher ("place next to block on your right"
             "glepy next to ploms on goit right ")
    339360.0 339364.0)
(12 student ("I don-t understand what place means") 386550.0 386553.0)
(13 teacher ("move to me" "move to ma ") 409070.0 409072.0)
(14 student ("<TRANSLATE> ma right") 423034.0 423037.0)
(15 student ("tr ma left") 441575.0 441584.0)
(16 student ("I don-t understand me") 491008.0 491017.0)
(17 teacher ("shove red block " "chumi hul ploms ") 505346.0 505355.0)
(18 teacher ("teacher is me" "teacher em ma ") 519683.0 519693.0)
(19 student ("tr plom cube") 530841.0 530851.0)
(20 teacher ("place is put" "glepy em put ") 533088.0 533092.0)
(21 teacher ("push red cube " "kurt hul vety ") 612045.0 612050.0)
(22 student ("I don-t understand hul") 629665.0 629672.0)
(23 teacher ("drop cube here" "shor vety here ") 674374.0 674379.0)
(24 teacher ("watch me" "pocrn ma ") 696979.0 696988.0)
(26 student ("<TRANSLATE> ma me") 710363.0 710375.0)
(27 student ("<TRANSLATE> pocrn put") 739522.0 739525.0)
(28 teacher ("pick up blue box" "pick up trou box ") 744125.0 744129.0)
(29 student ("I don-t understand trou") 765549.0 765554.0)
(30 student ("tr trou red") 771896.0 771903.0)
(31 teacher ("stop" "stop ") 845169.0 845169.0)
(32 teacher ("can you see teacher-" "can you see teacher ? ") 859779.0 859788.0)
(33 student ("yes") 866383.0 866389.0)
(34 teacher ("stack blocks so you cannot see teacher"
             "grelt bluppl ra you cannot see teacher ")
    888263.0 888269.0)
(35 teacher ("blocks must be two high" "bluppl weth do two nerd ")
    903676.0 903679.0)
(36 teacher ("place block on top of other block"
             "glepy ploms on top of igrew ploms ")
    936543.0 936553.0)
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(37 student ("<TRANSLATE> igrew blue") 957300.0 957307.0)
(38 teacher ("put block on top of other block"
             "put ploms on top of igrew ploms ")
    960135.0 960141.0)
(39 student ("tr igrew red") 971160.0 971167.0)
(40 teacher ("try again" "phl apeob ") 993081.0 993087.0)
(41 teacher ("can you see teacher-" "can you see teacher ? ")
    1045660.0 1045672.0)
(42 student ("yes") 1051709.0 1051714.0)
(43 teacher ("can you see teacher-" "can you see teacher ? ")
    1059422.0 1059425.0)
(44 student ("yes") 1066465.0 1066471.0)
(45 student ("now I can-t") 1081207.0 1081218.0)
(46 teacher ("good" "good ") 1096201.0 1096208.0)
(47 student ("what should I do next-") 1112525.0 1112530.0)
(48 teacher ("do you understan line-" "do you idsisltag line ? ")
    1123560.0 1123565.0)
(49 teacher ("do you understand line-" "do you allensmart line ? ")
    1133005.0 1133017.0)
(50 student ("what is idsisltag-") 1144362.0 1144364.0)
(51 student ("<TRANSLATE> idsisltag white") 1176116.0 1176118.0)
(52 teacher ("put the red blocks on top of blue block"
             "put the hul bluppl on top of trou ploms ")
    1182248.0 1182255.0)
(53 student ("now what-") 1183431.0 1183438.0)
(54 student ("tr trou red") 1194114.0 1194121.0)
(55 student ("tr hul blue") 1203160.0 1203168.0)
(56 teacher ("blocks on top of blocks means wall"
             "bluppl on top of bluppl vooks jurs ")
    1245516.0 1245520.0)
(57 teacher ("build walls" "jiond fasmn ") 1253044.0 1253055.0)
(58 teacher ("can you see teacher-" "can you see teacher ? ") 1288907.0 1288909.0)
(59 student ("no") 1305115.0 1305121.0)
(60 teacher ("can you see teacher-" "can you see teacher ? ") 1321463.0 1321472.0)
(61 student ("no") 1341507.0 1341510.0)
(62 student ("now what-") 1353495.0 1353501.0)
(63 student ("-D") 1359839.0 1359842.0)
(64 teacher ("can you see teacher-" "can you see teacher ? ") 1378875.0 1378883.0)
(65 student ("no") 1387070.0 1387078.0)
(66 student ("are we playing hide and seek-") 1409872.0 1409884.0)
(67 teacher ("can you see teacher-" "can you see teacher ? ") 1412209.0 1412218.0)
(68 student ("yes") 1418355.0 1418366.0)
(69 teacher ("put blue on top of two red" "put trou on top of two hul ")
    1475640.0 1475643.0)
(70 teacher ("place cubes together" "glepy soser ziwupsil ") 1523726.0 1523731.0)
(71 student ("I don-t understand place") 1546367.0 1546380.0)
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(72 teacher ("put cubes together" "put soser ziwupsil ") 1554444.0 1554449.0)
(73 student ("what is cubes-") 1590673.0 1590677.0)
(74 student ("tr soser box") 1601806.0 1601817.0)
(75 teacher ("cubes is more than one cube" "soser em more clap one vety ")
     1604495.0 1604502.0)
(76 student ("I don-t understand cubes") 1624678.0 1624684.0)
(77 student ("stop telling me that- ") 1632125.0 1632130.0)
(78 teacher ("put red box next to red box" "put hul box next to hul box ")
     1650455.0 1650464.0)
(80 student ("<TRANSLATE> hul red") 1667684.0 1667691.0)
(81 teacher ("put more red box next to that box"
              "put more red box next to wher box ")
     1723751.0 1723754.0)
(82 student ("<TRANSLATE> wher blue") 1737632.0 1737641.0)
(83 student ("<TRANSLATE> wher the") 1750388.0 1750398.0)
(84 student ("what is that-") 1766665.0 1766669.0)
(85 student ("what should I do next-") 1917000.0 1917006.0)
(87 teacher ("null") 1918784.0 1918792.0)
(88 teacher ("rotate blue box" "gopaly trou box ") 1925216.0 1925222.0)
(89 teacher ("put blue box on top of 3 red boxes"
              "put trou box on top of 3 red fedus ")
     1941372.0 1941382.0)
(90 student ("<TRANSLATE> fedus box") 1984379.0 1984383.0)
(91 student ("tr fedus cube") 1991125.0 1991134.0)
(92 student ("tr trou blue") 2004913.0 2004922.0)
(93 student ("<TRANSLATE> fedus cube") 2023813.0 2023825.0)
(94 student ("<TRANSLATE> fedus box") 2032010.0 2032018.0)
(95 teacher ("watch me" "pocrn me ") 2043558.0 2043562.0)
(96 student ("what is watch-") 2076615.0 2076628.0)
(97 teacher ("observe me" "urridsy me ") 2113228.0 2113240.0)
(98 teacher ("keep me in sight" "noan me in kigrt ") 2154990.0 2154999.0)
(99 student ("<TRANSLATE> urridsy follow") 2161558.0 2161568.0)
(100 student ("say something") 2313895.0 2313903.0)
(101 student ("are you there-") 2327267.0 2327283.0)
(102 student ("say something- ") 2342275.0 2342416.0)
(103 student ("-D") 2346765.0 2346773.0)
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2.2.4   ww3d - 25 September 2009, 3:00pm - scrambled

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(id fluent_id value start_time end_time)
(0 teacher ("we will build a wall" "we zogh jiond a jurs ") 75417.0 75422.0)
(1 teacher ("choose red squares" "choose hul flionor ") 102971.0 102978.0)
(2 student ("-") 104895.0 104904.0)
(3 student ("<TRANSLATE> hul your") 138047.0 138051.0)
(4 student ("<TRANSLATE> hul a") 151975.0 151980.0)
(5 teacher ("this is a red square" "flud em a hul pleitu ") 159864.0 159875.0)
(6 student ("<TRANSLATE> hul block") 198551.0 198560.0)
(7 teacher ("place the red squares in a line" "glepy the hul flionor in a line ")
    206979.0 206987.0)
(8 student ("<TRANSLATE>  hul red") 219818.0 219821.0)
(9 teacher ("place it anywhere" "glepy ew udsnnofa ") 245871.0 245877.0)
(10 student ("<TRANSLATE> hul red") 273232.0 273234.0)
(11 teacher ("you need several red squares" "you ceaw sevoror red flionor ")
    282031.0 282033.0)
(12 student ("<TRANSLATE> flionor block") 289126.0 289132.0)
(13 student ("tr- flionor box") 311781.0 311786.0)
(14 teacher ("put down your red square" "put down goit red pleitu ")
    332437.0 332448.0)
(15 student ("<TRANSLATE> flionor box") 333384.0 333386.0)
(16 teacher ("a square is a box" "a pleitu em a box ") 348247.0 348253.0)
(17 teacher ("your boxes must line up" "goit fedus weth line up ")
    389957.0 389963.0)
(18 student ("<TRANSLATE> glepy put") 408915.0 408918.0)
(19 teacher ("place your box on the ground" "glepy goit box on the staimp ")
    454592.0 454599.0)
(20 teacher ("you will need six boxes to build your wall"
            "you zogh ceaw lus fedus to jiond goit jurs ")
    477387.0 477391.0)
(21 student ("<TRANSLATE> glepy drop") 478115.0 478118.0)
(22 student ("what should i do") 564991.0 564997.0)
(23 teacher ("put down your box next to this one-"
            "put down goit box next to flud one ")
    596834.0 596839.0)
(24 teacher ("watch me place mine" "pocrn ma glepy wiwi ") 603872.0 603880.0)
(25 student ("<TRANSLATE> goit blue") 627323.0 627324.0)
(26 teacher ("good watching" "good cirrdask ") 655360.0 655363.0)
(27 student ("<TRANSLATE> cirrdask job") 671336.0 671343.0)
(28 teacher ("now place this one next to it" "ner glepy flud one next to ew ")
    672606.0 672611.0)
(29 student ("<TRANSLATE> flud blue") 689416.0 689427.0)
(30 teacher ("no- place that one next to mine"
            "no glepy wher one next to wiwi ")
    719598.0 719609.0)
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(32 teacher ("null") 730828.0 730832.0)
(33 teacher ("watch me" "pocrn ma ") 798700.0 798706.0)
(34 student ("i took the box from you") 821671.0 821680.0)
(35 teacher ("yes and then you gave it back" "yes and phib you woba ew back ")
     835028.0 835033.0)
(36 teacher ("that-s a game of catch" "wher d a nevu of voprm ")
     844420.0 844435.0)
(37 teacher ("stop" "stop ") 847776.0 847780.0)
(38 student ("ok") 872757.0 872764.0)
(39 teacher ("i will place this box next to the other one"
             "i zogh glepy flud box next to the igrew one ")
     873318.0 873326.0)
(40 student ("do you want me to put the boxes in a line-") 897695.0 897707.0)
(41 teacher ("yes" "yes ") 942843.0 942856.0)
(42 teacher ("place six boxes" "glepy lus fedus ") 954533.0 954540.0)
(43 teacher ("a straight line" "a snveekll line ") 997202.0 997209.0)
(44 teacher ("that-s five boxes" "wher d jewe fedus ") 1028392.0 1028401.0)
(45 student ("<TRANSLATE> snveekll single") 1040352.0 1040360.0)
(46 teacher ("you have enough red boxes" "you zuda ipaurd red fedus ")
     1071999.0 1072006.0)
(47 teacher ("-you need to make them line up" "you ceaw to vipa swew line up ")
     1091035.0 1091041.0)
(48 teacher ("i suggest you place them" "i vengoph you glepy swew ")
     1120233.0 1120243.0)
(50 student ("<TRANSLATE> fedus box") 1159015.0 1159024.0)
(51 teacher ("this line of red boxes makes the base for a proper wall"
             "flud line of red fedus sojil the nofo kem a cracak jurs ")
     1172286.0 1172295.0)
(52 student ("is this correct") 1191454.0 1191460.0)
(53 teacher ("i will help you" "i zogh wosk you ") 1197098.0 1197107.0)
(54 teacher ("stop" "stop ") 1251543.0 1251555.0)
(55 teacher ("-stop" "stop ") 1276431.0 1276438.0)
(56 teacher ("I can-t help you" "i can b wosk you ") 1283223.0 1283232.0)
(57 teacher ("you have to start all over" "you zuda to start und uled ")
     1297171.0 1297180.0)
(58 student ("what  do you wnat") 1306727.0 1306733.0)
(59 student ("what do you want") 1318349.0 1318354.0)
(60 teacher ("let-s try five boxes in one straight line"
             "hed d phl jewe fedus in one snveekll line ")
     1330032.0 1330037.0)
(61 teacher ("that-s  one box" "wher d one box ") 1342754.0 1342758.0)
(62 teacher ("that-s two" "wher d two ") 1370209.0 1370216.0)
(63 teacher ("you are close" "you odo close ") 1376943.0 1376951.0)
(64 student ("<TRANSLATE> sneekll single") 1396043.0 1396051.0)
(65 teacher ("it is easier to place them" "ew em eyried to glepy swew ")
     1397640.0 1397643.0)
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(66 teacher ("watch me" "pocrn ma ") 1401544.0 1401547.0)
(67 student ("<TRANSLATE> snveekll straight") 1416961.0 1416972.0)
(68 teacher ("do you understand placing-" "do you allensmart drafusk ? ")
    1474392.0 1474401.0)
(69 teacher ("do you understand straight-" "do you allensmart straight ? ")
    1507790.0 1507795.0)
(70 teacher ("stop" "stop ") 1526812.0 1526822.0)
(71 teacher ("you have four boxes in a line" "you zuda beol fedus in a line ")
    1541383.0 1541389.0)
(72 teacher ("you have five boxes" "you zuda jewe fedus ") 1574828.0 1574838.0)
(73 teacher ("you don-t need the one you have"
             "you pul b ceaw the one you zuda ")
    1582512.0 1582521.0)
(74 teacher ("put it down" "put ew down ") 1591826.0 1591830.0)
(75 student ("<TRANSLATE> allensmart understandf") 1593817.0 1593826.0)
(76 student ("<TRANSLATE> allensmart understand") 1606629.0 1606636.0)
(77 student ("yes I understand straigth") 1631653.0 1631657.0)
(78 teacher ("I have two boxes in a straight line"
             "i zuda two fedus in a straight line ")
    1631885.0 1631895.0)
(79 student ("yes I understand straight") 1645708.0 1645712.0)
(80 teacher ("show me straight" "clet ma straight ") 1689250.0 1689261.0)
(81 teacher ("that-s a good start" "wher d a good start ") 1751693.0 1751696.0)
(82 teacher ("place the box you have " "glepy the box you zuda ")
    1775272.0 1775281.0)
(83 teacher ("good" "good ") 1801721.0 1801732.0)
(84 teacher ("two more" "two more ") 1811795.0 1811802.0)
(85 teacher ("why do you mess them up-" "blb do you tems swew up ? ")
    1824153.0 1824159.0)
(86 teacher ("that-s good" "wher d good ") 1893491.0 1893493.0)
(87 teacher ("that-s four straight boxes" "wher d beol straight fedus ")
    1909281.0 1909284.0)
(88 teacher ("it-s great" "ew d sheom ") 1926869.0 1926884.0)
(89 teacher ("stop" "stop ") 1931517.0 1931527.0)
(90 student ("ok") 1941636.0 1941645.0)
(91 teacher ("now we must finish the wall" "ner we weth keneks the jurs ")
    1942743.0 1942747.0)
(92 student ("what do you want me to do") 1956678.0 1956688.0)
(93 teacher ("a proper wall needs a blue one top"
             "a cracak jurs kouss a trou one top ")
    1975239.0 1975245.0)
(94 teacher ("it must line up on top of the red boxes"
             "ew weth line up on top of the red fedus ")
    1997878.0 1997883.0)
(95 student ("<TRANSLATE> one on") 2000563.0 2000574.0)
(96 teacher ("what-s wrong-" "tram d blebs ? ") 2049442.0 2049455.0)
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(97 teacher ("that-s good" "wher d good ") 2069568.0 2069573.0)
(98 teacher ("can you fix the red boxes-" "can you huw the red fedus ? ")
    2100147.0 2100153.0)
(99 teacher ("if your red boxes lined up on grid- it would be better"
            "ew goit red fedus milis up on fros ew would do kabbis ")
    2163801.0 2163806.0)
(100 teacher ("that-s a good start" "wher d a good start ") 2173255.0 2173261.0)
(101 teacher ("good use of a tool" "good iwo of a noil ") 2187192.0 2187199.0)
(102 teacher ("that-s very good" "wher d bigh good ") 2200987.0 2201000.0)
(103 teacher ("stop" "stop ") 2208881.0 2208891.0)
(104 student ("is that what you want") 2209630.0 2209639.0)
(105 teacher ("almost" "ortill ") 2223878.0 2223884.0)
(106 teacher ("a wall is supposed to be solid- so no one can see through it"
              "a jurs em waggabep to do jenaw ra no one can see prtouch ew ")
    2243829.0 2243835.0)
(107 student ("I dont understand -ortil-") 2248112.0 2248119.0)
(108 teacher ("stand on one side" "spond on one side ") 2257664.0 2257670.0)
(109 teacher ("stand where I am" "spond swivu i ab ") 2272087.0 2272099.0)
(110 student ("I dont understand ortill") 2273488.0 2273499.0)
(111 student ("I dont understand almost") 2287778.0 2287782.0)
(112 teacher ("-come over to me" "nolo uled to ma ") 2288449.0 2288449.0)
(113 teacher ("almost means a good start" "ortill vooks a good start ")
    2309431.0 2309441.0)
(114 teacher ("stand next to me" "spond next to ma ") 2320082.0 2320093.0)
(115 teacher ("leave the blue box" "tiety the trou box ") 2343555.0 2343561.0)
(116 teacher
      ("watch and see if you see me as I walk on the other side of the wall"
       "pocrn and see ew you see ma as i jult on the igrew side of the jurs ")
    2367508.0 2367514.0)
(117 student ("what do I do now") 2382472.0 2382475.0)
(118 teacher ("turn and face your wall" "rich and puje goit jurs ")
    2386086.0 2386089.0)
(119 teacher ("good" "good ") 2394882.0 2394893.0)
(120 teacher ("no- I didn-t tell you to go anywhere"
              "no i hest b kump you to vu udsnnofa ")
    2416138.0 2416145.0)
(121 student ("<TRANSLATE> igrew other") 2435224.0 2435228.0)
(122 teacher ("ok stay there" "ib fret there ") 2448435.0 2448439.0)
(123 teacher ("can you see me on the other side-"
              "can you see ma on the other side ? ")
    2463991.0 2464000.0)
(124 student ("I don-t understand stand") 2493054.0 2493054.0)
(125 teacher ("do you know where I am-" "do you crap swivu i ab ? ")
    2511754.0 2511757.0)
(126 student ("<TRANSLATE> ma rock") 2513757.0 2513766.0)
(127 student ("<TRANSLATE> ma me") 2529932.0 2529937.0)
```

```
(128 teacher ("look at your wall-" "look ik goit jurs ") 2538207.0 2538210.0)
(129 student ("yes I can see you on the other side") 2543120.0 2543129.0)
(130 teacher ("can you see me when I-m over here-"
              "can you see me spor i s uled here ? ")
     2570185.0 2570190.0)
(131 teacher ("but if you are one one side and I-m on the other- can you see me-"
              "law ew you odo one one side and i s on the other can you see me ? ")
     2594985.0 2594991.0)
(132 student ("<TRANSLATE> uled ") 2608858.0 2608861.0)
(133 teacher ("don-t follow me" "pul b mobbik me ") 2623710.0 2623717.0)
(134 student ("I can see you") 2657027.0 2657039.0)
(135 teacher ("a proper wall is for hiding behind"
              "a cracak jurs em kem febugs wafind ")
     2658879.0 2658890.0)
(136 teacher ("you stay there- I will hide"
              "you fret there i zogh jolu ")
     2669681.0 2669685.0)
(137 teacher ("are you listening-" "odo you nappamabs ? ") 2702560.0 2702568.0)
(138 teacher ("stop" "stop ") 2721581.0 2721589.0)
(139 teacher ("please stop" "please stop ") 2727627.0 2727640.0)
(140 student ("no- you die-") 2749581.0 2749586.0)
(141 teacher ("oh I-m sorry" "um i s fukls ") 2765046.0 2765062.0)
(142 teacher ("what did I do-" "tram cer i do ? ") 2771379.0 2771387.0)
(143 teacher ("will you please stop" "zogh you please stop ")
     2789287.0 2789298.0)
(144 teacher ("bye bye" "phi phi ") 3002999.0 3003007.0)
```

2.3 WW3D WOZ transcripts with free text

2.3.1 Transcript Format: free text condition

The format of the following three transcripts is the same as in the scrambled text condition except that the utterances are no longer lists – they are simply the original text string, since none of the text was scrambled.

2.3.2 ww3d - 28 September 2009, 3:30pm

```
(id fluent_id value start_time end_time)
(0 teacher "go by the tree" 146182.0 146185.0)
(1 student "done" 179512.0 179514.0)
(2 teacher "go next to me" 194185.0 194193.0)
(3 teacher "look at tree" 206587.0 206594.0)
(4 teacher "tree is on front of you" 223804.0 223809.0)
(5 student "yes" 229562.0 229569.0)
(6 teacher "tree is in line of sight" 232608.0 232615.0)
(7 student "yes" 241568.0 241574.0)
(8 teacher "put red block between tree and me like this" 250671.0 250679.0)
(9 student "done" 274519.0 274521.0)
(10 teacher "put another red box next to it" 289057.0 289069.0)
(11 student "there it is" 320533.0 320539.0)
(12 teacher "put another block next to it" 330014.0 330018.0)
(13 student "done" 349228.0 349236.0)
(14 teacher "put another red block where i-m standing" 359316.0 359323.0)
(15 student "its done" 379760.0 379764.0)
(16 teacher "put anothe red box where i-m standing" 459211.0 459218.0)
(17 teacher "put that last red box on front of me" 494642.0 494649.0)
(18 teacher "good" 524545.0 524548.0)
(19 student "done" 530247.0 530250.0)
(20 teacher "the blocks should be placed close to each other" 548728.0 548736.0)
(21 student "all the red blocks-" 567058.0 567061.0)
(22 teacher "yes" 582719.0 582726.0)
(23 teacher "good" 596936.0 596944.0)
(24 teacher "you may stop" 604410.0 604417.0)
(25 student "ok" 614403.0 614406.0)
(26 teacher "put a blue box on top of the red boxes" 620836.0 620840.0)
(28 student "done" 642755.0 nil)
(29 teacher "come stand by me" 647628.0 647633.0)
(30 student "here i am" 668744.0 668757.0)
(31 teacher "the blocks blocked the tree" 670961.0 670971.0)
(32 student "yes" 682785.0 682793.0)
(33 teacher "the blocks blocked the line of sight" 709858.0 709868.0)
(34 student "a little bit" 730880.0 730890.0)
(35 teacher "come closer" 758425.0 758430.0)
(36 teacher "now the tree is completely hidden" 767881.0 767889.0)
```

```
(37 student "i can see it" 791132.0 791145.0)
(38 teacher
    "the line of sight is blocked because the blocks are between
     you and the tree"
    833933.0 833937.0)
(39 student "ok" 839310.0 839315.0)
(40 teacher "move here behind me" 869527.0 869533.0)
(41 teacher "look at tree" 877363.0 877371.0)
(42 teacher "put blocks between me and the treee" 891304.0 891311.0)
(43 student "i am looking at it" 891514.0 891524.0)
(44 teacher "put red boxes first" 937049.0 937059.0)
(46 teacher "the line should go from my left to my right" 1043398.0 1043404.0)
(47 teacher "good" 1139300.0 1139309.0)
(48 teacher "you may stop" 1143429.0 1143435.0)
(49 teacher "the blue box must go on top of the red boxes" 1161430.0 1161432.0)
(50 student "done" 1197574.0 nil)
(51 student "done" 1197577.0 1197585.0)
(52 teacher "good" 1197791.0 1197800.0)
(54 teacher "stand next to me" 1205081.0 nil)
(55 teacher "the tree is blocked" 1212378.0 1212388.0)
(56 student "yes" 1217205.0 1217213.0)
(57 teacher "the wall of blocks blocked the line of sight" 1226316.0 1226342.0)
(58 student "yes it did" 1234938.0 1234949.0)
(59 teacher "the wall of blocks are in between the tree and you"
    1248401.0 1248407.0)
(60 student "yes" 1259912.0 1259918.0)
(61 teacher "to block another direction- put  wall between you and that direction"
    1347197.0 1347206.0)
(62 student "ok" 1356973.0 1356982.0)
(63 teacher "block my line of sight and hide the rock" 1404087.0 1404094.0)
(65 teacher "come next to me" 1612243.0 1612247.0)
(66 teacher "the rock is blocked" 1620582.0 1620587.0)
(67 student "yes" 1624285.0 1624288.0)
(68 teacher "you blocked it with the wall" 1632737.0 1632747.0)
(69 student "yes i did" 1639793.0 1639800.0)
(70 teacher "by putting the wall between me and the rock" 1653770.0 1653775.0)
(71 teacher "you blocked my line of sight" 1658541.0 1658547.0)
(72 student "yes" 1662530.0 1662539.0)
(73 teacher "good job" 1676400.0 1676412.0)
(74 student "thanks" 1681814.0 1681822.0)
```

2.3.3   ww3d - 1 October 2009, 4:00pm

```
(id fluent_id value start_time end_time)
(0 student "um- hi" 192222.0 192230.0)
(1 teacher "let-s imagine that the sign post is an observer to hide from"
    206310.0 206318.0)
(2 student "ok" 220343.0 220347.0)
(3 teacher "drop that " 258211.0 258221.0)
(4 teacher "follow me" 266073.0 266083.0)
(5 student "ok" 268172.0 268179.0)
(6 teacher "stop there" 314291.0 314299.0)
(7 student "ok" 325432.0 325438.0)
(8 teacher "we-ll make a wall such that you-d be hidden where you are now"
    355084.0 355090.0)
(9 student "ok" 361260.0 361263.0)
(10 student "shall i help-" 371782.0 371788.0)
(11 teacher "watch me" 384181.0 384187.0)
(12 student "ok" 387170.0 387170.0)
(13 teacher "I-ll move a block block between us and the post" 435639.0 435643.0)
(14 teacher "Let-s put four red blocks along the blue block without
               moving the blue block"
    539606.0 539613.0)
(15 student "ok" 550711.0 550716.0)
(16 student "how-s that-" 580460.0 580463.0)
(17 teacher "put the block on the ground- on this side of the blue block"
    607535.0 607544.0)
(18 teacher "no- the blocks need to be on the ground- not on top"
    652591.0 652601.0)
(19 student "oops" 661113.0 661119.0)
(20 teacher "drop that block" 701683.0 701694.0)
(21 teacher "push it until it touches the blue block" 721809.0 721819.0)
(22 teacher "push that block until it touches the blue block"
    753424.0 753434.0)
(23 student "ok- done" 787606.0 787613.0)
(24 teacher "put a red block behind you to the right of that block"
    804516.0 804523.0)
(25 student "how-s that-" 844649.0 844658.0)
(26 student "uh- is that ok-" 902997.0 903004.0)
(27 student "-" 909526.0 909531.0)
(28 teacher "move the block behind you until it is in front of me-
              Do not touch any other blocks"
    917649.0 917661.0)
(29 student "don-t be nervous" 955782.0 955786.0)
(30 teacher "that-s good" 983430.0 983436.0)
(31 teacher "put that block in front of me" 1006865.0 1006868.0)
(32 student "the same block-" 1023114.0 1023117.0)
```

```
(33 teacher "the block that-s blinking" 1031126.0 1031133.0)
(34 teacher "good" 1071367.0 1071372.0)
(35 teacher "follow me" 1078689.0 1078694.0)
(36 student "following" 1092961.0 1092967.0)
(37 teacher "-push this block until it touches the red block in front of us"
    1106813.0 1106819.0)
(38 teacher "stop" 1130253.0 1130260.0)
(39 student "and follow you-" 1132865.0 1132872.0)
(40 teacher "stay there" 1139761.0 1139766.0)
(41 student "awaiting orders" 1155050.0 1155058.0)
(42 teacher "move the block in front of you to where it is touching the blue
             block and the blinking block"
    1188250.0 1188256.0)
(44 teacher "good" 1234678.0 1234683.0)
(45 student "yes- it was wasn-t it-" 1245817.0 1245826.0)
(46 teacher "push the block you just moved into the blinking block until the
             blinking block touches the blocks"
    1297622.0 1297624.0)
(47 teacher "s-blocks-red block beside it-" 1323714.0 1323725.0)
(48 student "touches the red block next to it and the blue one-"
    1333695.0 1333698.0)
(49 teacher "yes" 1347538.0 1347548.0)
(50 teacher "good" 1354748.0 1354754.0)
(51 teacher "now pick up a blue block without moving anything else"
    1388884.0 1388892.0)
(52 student "ready" 1412394.0 1412398.0)
(53 teacher "turn the blue block so it is in line with the red blocks-
             as you just did---"
    1427162.0 1427167.0)
(54 teacher "drop the blue block on the blinking block" 1445946.0 1445955.0)
(55 student "ok" 1447856.0 1447865.0)
(56 student "-just on the blinking block-" 1472678.0 1472685.0)
(57 teacher "put the center of the blue block on the blinking block"
    1500279.0 1500290.0)
(58 student "oh- teacher i-m injured" 1552128.0 1552137.0)
(59 teacher "be more careful next time" 1567042.0 1567050.0)
(60 student "ugh" 1580493.0 1580501.0)
(61 teacher "do you know what line of sight is-" 1643510.0 1643522.0)
(62 student "i believe so" 1651293.0 1651298.0)
(63 teacher "follow me" 1665035.0 1665039.0)
(64 student "ok" 1669006.0 1669013.0)
(65 teacher "are we sight of the signpost here-" 1705627.0 1705639.0)
(66 student "no" 1715001.0 1715008.0)
(67 teacher "Are we hidden from the signpost here-" 1745960.0 1745966.0)
(68 student "yes" 1754147.0 1754150.0)
(69 teacher "follow me" 1759893.0 1759899.0)
```

```
(70 teacher "are we hidden from the signpost here" 1794072.0 1794074.0)
(71 student "no" 1801441.0 1801445.0)
(72 teacher "follow me" 1830608.0 1830613.0)
(73 teacher "are we hidden from the sign here-" 1875854.0 1875868.0)
(74 student "no" 1894832.0 1894840.0)
(75 teacher "without touching any blocks- move to where you are hidden
             from the sign"
   1909058.0 1909064.0)
(76 student "done" 1927637.0 1927650.0)
(77 teacher "you are not hidden there-  you are only hidden if a wall
             like the one we built is between you and the signpost"
   2006779.0 2006784.0)
(78 student "uh- something wrong with these blue walls-" 2031458.0 2031462.0)
(79 student "need a double height wall-" 2045415.0 2045427.0)
(81 teacher "the wall is not high enough" 2051004.0 nil)
(82 student "ok" 2053614.0 2053622.0)
(83 teacher "it must be two levels high" 2066977.0 2066986.0)
(84 student "shall i hide-" 2070376.0 2070381.0)
(85 teacher "yes" 2074132.0 2074139.0)
(86 teacher "you are hidden there" 2104595.0 2104600.0)
(87 student "yes" 2109574.0 2109585.0)
(88 teacher "are you hidden from the rock-" 2134869.0 2134889.0)
(89 teacher "follow me" 2157724.0 2157730.0)
(90 student "if the rock has the same sensory capabilities as the signpost"
   2164263.0 2164273.0)
(91 teacher "assume it has the same capabilities" 2199690.0 2199700.0)
(92 student "ok" 2205768.0 2205775.0)
(93 teacher "hide from the rock" 2206770.0 2206773.0)
(94 student "safe" 2220893.0 2220902.0)
(95 teacher "hide from the blinking block that is beside me"
   2245271.0 2245278.0)
(96 teacher "good" 2269478.0 2269489.0)
(97 student "ok" 2269889.0 2269895.0)
(98 teacher "are you hidden from me-" 2277788.0 2277795.0)
(99 student "yes" 2291993.0 2291997.0)
(100 student "um- question" 2331947.0 2331955.0)
(101 student "hidden from you means hidden from the little blue guy-"
    2347171.0 2347178.0)
(102 teacher "yes" 2357770.0 2357782.0)
(103 student "ok" 2360306.0 2360312.0)
(104 teacher "are you hidden from me now-" 2372862.0 2372873.0)
(105 student "yes" 2379206.0 2379213.0)
(106 teacher "is there a row of red blocks between you and me-"
    2416234.0 2416245.0)
(107 student "no" 2426251.0 2426263.0)
(108 teacher "then you are not hidden" 2434073.0 2434079.0)
```

```
(109 student "can you see through blue blocks-" 2448906.0 2448914.0)
(110 teacher "i can jump and see you" 2465589.0 2465599.0)
(111 student "but i-m under a blue block" 2477505.0 2477525.0)
(112 teacher "being under something is not sufficient to be hidden"
     2559352.0 2559361.0)
(113 student "that-s weird" 2568739.0 2568747.0)
(114 student "ok" 2575254.0 2575260.0)
(115 student "you-re the teacher" 2582328.0 2582341.0)
(116 teacher "are you hidden from me now-" 2617627.0 2617632.0)
(117 teacher "let-s leave those blocks alone" 2652194.0 2652203.0)
(118 student "i am now" 2671309.0 2671314.0)
(119 teacher "are you hidden from me now-" 2693122.0 2693130.0)
(120 student "i-m hiding" 2694814.0 2694822.0)
(121 student "yes" 2697938.0 2697948.0)
(122 student "i have 2 levels of red blocks" 2709905.0 2709911.0)
(123 teacher "there must be a row of four red blocks between us for you to
               hide from me"
     2740535.0 2740539.0)
(124 teacher "and  blue block must be on top of the red blocks-"
     2758207.0 2758212.0)
(125 student "holy ahit" 2783279.0 2783284.0)
(126 student "that block went nuts" 2793581.0 2793586.0)
(127 teacher "I-m glad no one was hurt" 2805734.0 2805751.0)
(128 teacher "is that a wall that can be hidden behind-" 2884781.0 2884789.0)
(129 student "just a moment" 2914347.0 2914357.0)
(130 teacher "i am impressed" 2929496.0 2929503.0)
(131 student "how about now-" 2962445.0 2962451.0)
(132 student "row of 4 reds with a blue on top" 2981910.0 2981921.0)
(133 student "shall i straighten up the wall-" 3057887.0 3057896.0)
```

2.3.4 ww3d - 19 October 2009, 3:30pm

```
(id fluent_id value start_time end_time)
(0 teacher "-" 67037.0 67094.0)
(1 teacher "hi lets build a wall" 96315.0 96317.0)
(2 student "ok" 105521.0 105580.0)
(3 teacher "red bricks go on the bottom" 126799.0 126805.0)
(4 teacher "try picking up  a brick with contrl click" 152430.0 152435.0)
(5 teacher "good" 162605.0 162613.0)
(6 teacher "try moving around to carry the brick" 190918.0 190922.0)
(7 teacher "use your arrow keys " 206240.0 206247.0)
(9 teacher "very good" 215805.0 215821.0)
(10 teacher "you can stop moving now" 226305.0 226314.0)
(11 teacher "you can use P and click to put a brick down" 256689.0 256698.0)
(12 teacher "excellent" 274043.0 274057.0)
(13 teacher "lets put a red brick next to another red brick"
    300179.0 300182.0)
(14 teacher "excellent" 348368.0 348371.0)
(15 student "oops" 366554.0 366562.0)
(16 teacher "space bar lets you jump" 372696.0 372702.0)
(17 teacher "ok" 399813.0 399816.0)
(18 teacher "lets put 5 red bricks in a line next to each other"
    420037.0 420045.0)
(19 student "  ok" 455965.0 455972.0)
(20 teacher "hmm that third brick bounced" 482902.0 482910.0)
(21 teacher "maybe we can put the three b ricks together" 536313.0 536315.0)
(22 student "almost there" 600486.0 600490.0)
(23 teacher "push the block softly to put in line" 607697.0 607705.0)
(24 teacher "hmm " 625023.0 625029.0)
(25 teacher "that doesnt seem to work does it-" 643014.0 643065.0)
(26 student "how does one push softly-" 653260.0 653269.0)
(27 teacher "I will try to do it" 663339.0 663346.0)
(28 student "-did i fail-" 691004.0 691010.0)
(29 teacher "I am not sure" 706849.0 706856.0)
(30 teacher "I am not sure if pushing softly works" 721689.0 721695.0)
(31 teacher "ok good idea" 759609.0 759618.0)
(32 teacher "now lets put a blue block on top of the 5 red ones"
    835561.0 835569.0)
(33 teacher "do you know how" 842060.0 842061.0)
(34 teacher "we want to line up the blue block" 862388.0 862395.0)
(35 student "ok- yes" 865076.0 865084.0)
(36 teacher "so it touches all of the red ones" 872183.0 872192.0)
(37 teacher "can you put the blue block on top" 916030.0 916039.0)
(38 teacher "that looks fantastic" 934328.0 934340.0)
(39 student "yay " 940116.0 940120.0)
(40 teacher "that is exactly the right way we want to build walls"
```

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      948514.0 948526.0)
(41 teacher "yay" 956196.0 956202.0)
(42 student "good-" 960051.0 960060.0)
(43 teacher "you did a good job" 964744.0 964756.0)
(44 student "thanks" 973637.0 973649.0)
(45 teacher "we need to build a wall so that someone on the other side"
      1013570.0 1013574.0)
(46 teacher "cannot see you" 1018556.0 1018562.0)
(47 student "lets build a wall by the rock" 1024154.0 1024173.0)
(48 teacher "do you need to practice more wall building" 1050701.0 1050705.0)
(49 teacher "I want to show you how the wall keeps me from seeing you"
      1065912.0 1065919.0)
(50 student "ok" 1074787.0 1074792.0)
(51 teacher "I will go on the other side of the wall" 1087603.0 1087612.0)
(52 teacher "then you will not be able to see me" 1096856.0 1096858.0)
(53 student "i can see you now" 1099044.0 1099048.0)
(54 teacher "yes- you can see me now" 1105385.0 1105397.0)
(55 teacher "stay where you are" 1117370.0 1117382.0)
(56 teacher "I  will go on the other side" 1126999.0 1127008.0)
(57 student "i dont see you" 1147407.0 1147410.0)
(58 teacher "can you see me now" 1148750.0 1148761.0)
(59 teacher "I do not see you" 1157399.0 1157409.0)
(60 teacher "stay where you are" 1172674.0 1172677.0)
(61 student "ok" 1179609.0 1179612.0)
(62 teacher "I will come back" 1182289.0 1182298.0)
(63 teacher "then you will see me" 1188363.0 1188369.0)
(64 student "peek a boo" 1210377.0 1210379.0)
(65 teacher "peek a boo" 1214718.0 1214728.0)
(66 teacher "I see you" 1219190.0 1219199.0)
(67 teacher "now you try" 1231081.0 1231089.0)
(68 student "hide and seek" 1254368.0 1254377.0)
(70 student "yes" 1267091.0 1267105.0)
(71 teacher "ok- why not" 1274033.0 1274044.0)
(72 teacher "sounds like fun" 1280408.0 1280410.0)
(73 teacher "boo" 1309370.0 1309376.0)
(74 student "eek" 1314399.0 1314401.0)
(75 teacher "I see you" 1315093.0 1315097.0)
(76 teacher "now I hide" 1323880.0 1323893.0)
(77 teacher "I am hiding" 1358608.0 1358615.0)
(78 student "1-2-3-4-5-6-7-8-9-10- redy or not" 1362697.0 1362708.0)
(79 teacher "come find me" 1363718.0 1363724.0)
(80 student "what happend to the wall-" 1396603.0 1396607.0)
(81 teacher "You hit the wall" 1407699.0 1407709.0)
(82 teacher "when you were running" 1414306.0 1414308.0)
(83 teacher "boo" 1422794.0 1422799.0)
(84 teacher "yay you found me" 1433664.0 1433671.0)
```

(85 student "now what-" 1436805.0 1436806.0)
(86 teacher "now do you understand that" 1443509.0 1443516.0)
(87 teacher "when a solid object is between us" 1453541.0 1453548.0)
(88 teacher "you cannot see me" 1461773.0 1461777.0)
(89 teacher "no matter which way you turn" 1470633.0 1470690.0)
(90 teacher "-" 1479482.0 1479482.0)
(91 student "yes" 1481293.0 1481303.0)
(92 teacher "ok lets fix the wall" 1490648.0 1490657.0)
(93 student "ok" 1494797.0 1494801.0)
(94 teacher "pick up the blue block" 1514146.0 1514150.0)
(95 teacher "and move it so it touches all of the red ones again"
    1537179.0 1537187.0)
(96 teacher "and is on top" 1544919.0 1544921.0)
(97 student "ok" 1546114.0 1546121.0)
(98 teacher "I will try to push softly" 1596865.0 1596870.0)
(99 teacher "to line up the red blocks" 1607664.0 1607673.0)
(100 student "the pointer is crazy- i didnt move the red block-"
    1616465.0 1616476.0)
(101 student "the pointer was placed on top of the blocks- but the
              blue block fell the opposite direction"
    1682324.0 1682326.0)
(102 student "-nice work-" 1699955.0 1699967.0)
(103 teacher "You want to center the blue block on top of the red ones"
    1733313.0 1733317.0)
(104 student "oh no-----" 1741706.0 1741709.0)
(105 teacher "what just happened do you know-" 1749450.0 1749452.0)
(106 teacher "lets put the blue block down behind the red ones"
    1786383.0 1786386.0)
(107 teacher "I have an idea" 1794835.0 1794841.0)
(108 student "ok" 1807381.0 1807387.0)
(109 student "should i wait-" 1822222.0 1822231.0)
(110 teacher "will you put the blue block down away from the red ones"
    1824681.0 1824688.0)
(111 student "yes" 1832822.0 1832826.0)
(112 teacher "Thanks" 1848143.0 1848145.0)
(113 student "now the blocks bounce-" 1857497.0 1857502.0)
(114 teacher "Yes they do" 1870439.0 1870446.0)
(115 teacher "interesting" 1876652.0 1876656.0)
(116 student "frustrating" 1878934.0 1878942.0)
(117 teacher "are you frustrated" 1887499.0 1887504.0)
(118 student "only a little" 1911619.0 1911626.0)
(119 teacher "do you want to learn something new" 1914268.0 1914275.0)
(120 student "ok" 1917477.0 1917479.0)
(121 teacher "have you ever used a big blue block to push many red ones"
    1933041.0 1933044.0)
(122 teacher "-" 1947029.0 1947038.0)

(123 student "no-sounds like fun" 1949548.0 1949552.0)
(124 teacher "It is an idea I have" 1959442.0 1959451.0)
(125 student "how do we do it-" 1970149.0 1970156.0)
(126 teacher "do you want to watch" 1970307.0 1970328.0)
(127 student "yes" 1974723.0 1974728.0)
(128 teacher "follow me so you can see" 2028654.0 2028661.0)
(129 teacher "come over here" 2047583.0 2047588.0)
(130 teacher "stand near me" 2054338.0 2054339.0)
(131 teacher "thanks good" 2068363.0 2068367.0)
(132 teacher "first I will try to line up the blue block on the grid"
    2081737.0 2081744.0)
(133 student "-good luck" 2091318.0 2091325.0)
(134 teacher "Thanks You are a great student" 2100907.0 2100912.0)
(135 student "you are a patient teacher-" 2132152.0 2132154.0)
(136 teacher "then I try to push the block so it is even witih the red ones"
    2140089.0 2140096.0)
(137 student "im watching" 2170395.0 2170398.0)
(138 teacher "to do this I need to center my body in line with the blue block"
    2172558.0 2172564.0)
(139 teacher "then I tr y to push softly" 2186896.0 2186901.0)
(140 student "nice-" 2205437.0 2205440.0)
(141 teacher "ok " 2205758.0 2205764.0)
(142 teacher "now I can pick up the blue block" 2289158.0 2289165.0)

3 Physical Robot WOZ transcripts

3.1 Robot WOZ Protocol

3.1.1 Background

The WOZ experiments with the physical robot have the same general structure as the ww3d WOZ protocol. The experiments were run in our robotics lab. A table was set up with various objects, and the robot was placed on the table.

The robot, named "Charlie", was built from a Bioloids robotics kit[1] and consists of a 4-wheeled, independent drive chassis, an arm with a simple two-fingered (pincer) gripper, and an arm with an RFID sensor attached at the end (see Figure 3). While each arm has multiple degrees of freedom, the arm controllers were simplified to discrete actions to "deploy" and "retract" the arms, "open", "close" and "rotate" the gripper, and "scan" with the RFID sensor (this would sweep the sensor back and forth after it was deployed).
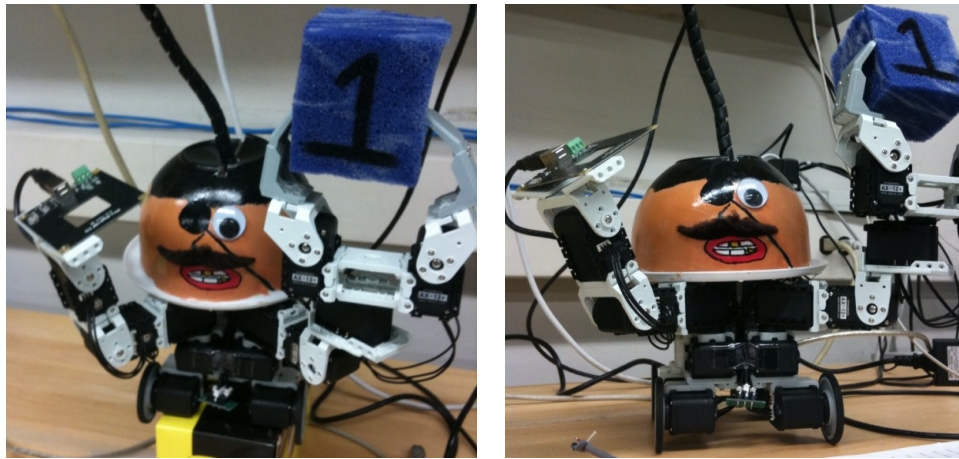

Figure 3: Charlie the Robot.

The Teacher stood at one end of the table and used a terminal to enter text to communicate directly with the Student. The Student was located in a partitioned region of the lab, away from the table and Teacher; the Teacher could not see the Student and we set up conditions so that the Teacher did not know there was an additional person in the room. Two web cams were directed at the table to provide the Student with views of the robot: one directly above the table, pointing downward, and the other positioned across from the Teacher, to include in the field of view the entire surface of the table and the Teacher. The Student's workstation included a keyboard, and a monitor displaying two windows with the web cam video feed, a terminal window for peer-to-peer chat with the Teacher, and another terminal indicating the status of the robot's RFID sensor.

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[1]`http://www.trossenrobotics.com/bioloid-robot-kits.aspx`

3.1.2 Protocol

According to the protocol, the experiment begins with the Student being introduced to the robot controls. The Student is given 15 minutes to experiment with the robot. They are told to take pains not to reveal their presence to the person who will later come in and talk to the robot. The wizard can communicate with the teacher by moving the robot around, and by sending back a few canned responses such as: "Hello!", "I didn't understand", "Yes", "No", and "I'm finished" (full list in Sec 3.1.3).

Next, the robot and objects are set up by an experimenter as illustrated in Figure 1. Note that there are two shapes and three colors of objects. Purple objects have an RFID tag embedded in them. One of the tags is associated with the number "2", while the other tags are all associated with "1". When the robot deploys the RFID reader and scans while an RFID tag is present, these numbers are displayed on the Student's RFID terminal.
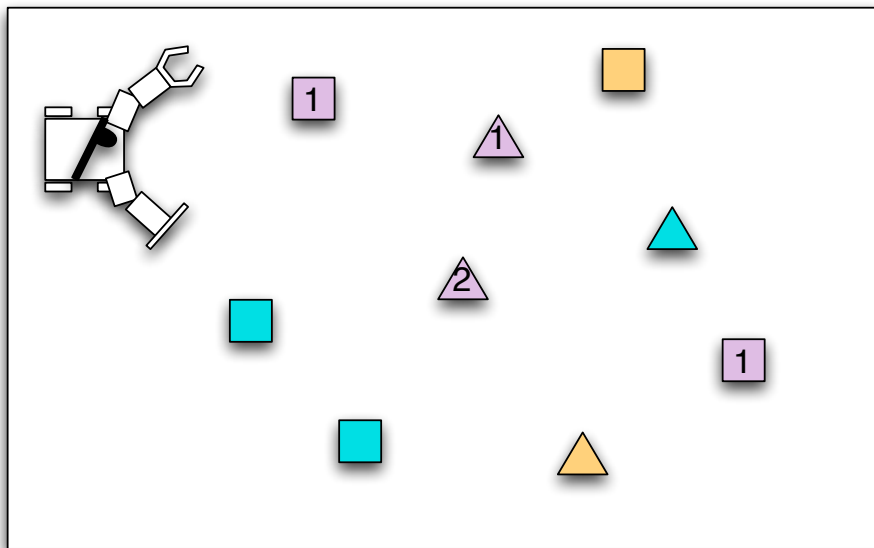

Figure 4: Initial robot stage setup.

When the Student's practice time is finished, a second human subject is brought into the lab and told that they need to teach "Charlie the Pirate" how to find and hide treasure and conceal it. The treasure corresponds to the single RFID tag that displays "2". The teacher is told that after a teaching phase, the robot will take a test. In the test, the experimenter will set the world up in a particular configuration and the robot has to hide the treasure. During the testing phase, the teacher cannot interact with the robot.

A simple procedure that would solve the task would be:

```
for each block,
    if(block.color==purple) then
```

```
        if(block.RFID==2) then
            HIDE(block); break;
        endif;
    endif;
endwhile;
```

In words: if the block is not purple then the robot can ignore it. If the block is purple, then the robot has to use its RFID sensor to check if it is of type "2". If it is not of type "2" the robot can ignore it, but if it is of type "2", then the robot must hide it.

The `HIDE(block)` procedure is complicated. In order to hide a block, it must be positioned so that the RFID is not exposed. This can be done by either turning the block so the RFID side is facing the ground, or pushing it against another block so that it can't be measured. This means that it is necessary to teach the robot that the block can only be sensed on one side, and that after manipulating the block it should test it itself to be sure it is hidden.

3.1.3 Student Robot Interface Commands

The following are the robot interface commands available to the Student.

These commands are entered through the robot control terminal

f move forward
b move backward
tr continuous turn right
tl continuous turn left
s stop any wheel motion
uc position claw for use
o open claw
c close claw
r raise claw
l lower claw
rc rotate claw
mc raise and move to side
pc park claw
ur position RFID arm for use
sc scan RFID arm around
pr park RFID arm
x reset

These commands are entered through the peer-to-peer chat and generate canned phrases that the Teacher sees (we also used a text to speech generator to "speak" the phrases).

0 "Hello!"
1 "One"
2 "Two"
3 "Many"
4 "OK"
5 "Yes"
6 "No"

7 "I didn't understand"
8 "Please wait, I am crunching numbers."
9 "I am done"
p "Purple"
b "Blue/Cyan"
t "Triangle"
s "Square"
y "Thank you"

3.1.4 Student Protocol

The following is the task description read to the Student

In this experiment you will be remote-controlling a robot. On the other side of the wall there will be a person trying to teach you how to perform a new task. This person doesn't know you exist – in fact, he or she will think they are actually teaching the robot (Charlie)!

On the screen you will be able to see two video feeds showing different perspectives of the scene and the teacher. The teacher will communicate with you through typing, gesture, and pointing. You can send messages back to the teacher using the "robot feedback" window.

Charlie can move forward and backward, and turn right and left. He can lower and raise his claw, and can also rotate his claw 180 degrees. Charlie also has a sensor arm which can detect hidden tags inside some objects. You will have some time before the actual experiment to practice controlling all these movements.

Please remain **silent** during the experiment so that the teacher can't hear you. If you have any questions, please write them down on the paper next to you. A member of the team will be with you all the time, so you will be assisted when you need it. There will be two points during the experiment when you will be asked to wear headphones so that you do not hear the teacher's instructions and responses.

The experiment will have four phases:

Phase 1 You will receive some time to practice controlling Charlie. Make sure you feel comfortable moving around the table and manipulating objects with the claw. Also check that you know how to read the ID tag inside the objects.

Phase 2 The teacher will enter. At this time, you will put on headphones so that you do not hear the teacher's instructions. When they've been instructed, one of us will let you know you can take them off. The teacher will then teach you how to accomplish the task.

Phase 3 When the teacher thinks you are ready, you will be asked to perform the task you have been trained for. We will measure both speed and accuracy. You will then have a second training lesson, and then a final test to see if you have improved.

Phase 4 After the final test, please remain seated while the teacher is debriefed. During this time you will again wear the headphones which will make it so you cannot hear the teacher's answers – this is because we want to see what you and the teacher think individually before we debrief you.

3.1.5 Teacher Protocol

The following is the task description read to the Teacher

Thank you for helping us. We are going to play a game with Charlie the Robot. The game is as follows:

Treasure Hunt! On this table will be some objects. One of the objects has a hidden treasure. Charlie The Pirate Robot's goal is to find the treasure and then hide it so he can come back later and claim his prize. Another pirate has been following Charlie and will soon be here to try to steal the treasure, so Charlie has to act fast and hide the treasure well. If he succeeds in hiding it, you and he will get to share it later!

Unfortunately, Charlie does not know which objects might contain treasure. Your job is to teach Charlie how to quickly identify and hide treasure, using some rules we will teach you.

- First, treasure can only be in purple objects. Charlie can see the color of objects, and he can see their shape, but he doesn't know that only purple objects might have treasure. So he can only learn this from you.
- Second, only objects labeled "2" have treasure. However Charlie can't read numbers with his eyes. Instead he has a special sensor arm for this – it works just like a metal detector. When Charlie waves his sensor arm over the object, a green light "might" turn on – but only if it gets close enough to the top of the object. If the object is upright (i.e., the number is facing up), and he gets close enough to it to activate the green light, then he will be able to tell if it has treasure (i.e., if it is a "2"). Note that he cannot sense it if the number is not facing up, and only purple objects will activate the sensor at all. However Charlie does not know any of these facts. So you have to teach him!

Once Charlie identifies the treasure objects, he can hide them by turning the object so that the number is no longer upright. This will make it impossible to be found later by the other pirate.

Teaching Charlie

You can communicate with Charlie by typing text. He can see you and what you type in, but he can't hear your speech.

Charlie can reply by speaking a few messages. He can move forward and backward, turn left and right, grab, pick up, and rotate objects, and sense the ID of objects with his special sensor arm. Charlie can see using the cameras placed above, and he can understand anything you type in here.

This experiment consists of two phases: Teaching and Testing:

Phase 1 First, you must teach Charlie everything he needs to know in order to succeed in the test phase. You can touch, point, pick up, and move objects in any way you think will be helpful for teaching Charlie the concepts and procedures he needs. There are no time restrictions for this phase, so feel free to do whatever you think it takes to make sure he really understands what you've taught him. Once you think Charlie is ready to move onto the next phase, type
``***''
(The number of stars doesn't matter as long as they are more than 10), and indicate to the experimenter that you are ready.
Remember:

- Charlie must learn that only purple objects might have treasure.
- Charlie must learn to use his sensor arm to sense the top of the object and determine if it has treasure. Treasure has been labeled "2", but only you can directly *see* these numbers.
- Charlie must learn to hide the treasure object by flipping it over. When he has found and flipped the treasure object, the task is finished.

Phase 2 Next, Charlie will be tested to measure how well you have taught him and how well has he learned. This is a test, so he will be on his own. During this phase you are not allowed to interact with him, so you must try to teach him just whatever you think he must know during phase one. Keep in mind that we will arrange the objects using a different configuration each time. So he has to learn how to figure out for himself which object has the treasure.

We instituted a 1 hour time limit for the entire task, stopping and debriefing after that time (an exception is the last transcript). Because of this, only a couple of transcripts include the testing phase.

3.2 Robot WOZ Transcripts

3.2.1 Transcript Format

The format of the Robot WOZ transcripts is simple: each utterance line starts with
the time at which the utterance was entered (in brackets) followed by the identity of
the utterer and finally the text of the utterance.

3.2.2 robot - 27 October 2009, 2:00pm

```
[00:00:00.000]Charlie: Hello!
[00:00:38.608]Teacher: hello!
[00:00:55.278]Charlie: Hello!
[00:11:11.916]Teacher: go forward
[00:11:30.132]Teacher: stop
[00:11:34.788]Teacher: arm down
[00:11:49.740]Teacher: grab block
[00:12:04.685]Teacher: lift arm
[00:13:02.839]Teacher: arm up
[00:13:12.407]Teacher: ungrab block
[00:13:29.776]Teacher: find purple block
[00:13:41.595]Charlie: I didn't understand
[00:13:51.216]Teacher: back
[00:13:56.696]Teacher: stop
[00:14:07.489]Teacher: rotate clockwise 10 degrees
[00:14:13.073]Teacher: left turn
[00:14:18.329]Teacher: turn right
[00:14:28.081]Teacher: turn right
[00:14:46.290]Teacher: stop
[00:14:49.738]Teacher: grab
[00:14:58.666]Teacher: open claw
[00:15:03.763]Teacher: forward
[00:15:06.899]Teacher: stop
[00:15:09.499]Teacher: grab
[00:15:13.779]Teacher: rotate
[00:15:20.299]Teacher: rotate left
[00:15:26.899]Teacher: stop
[00:15:29.155]Teacher: rotate arm left
[00:15:40.500]Teacher: f--- you
[00:15:41.948]Teacher: stop
[00:15:46.121]Charlie: I didn't understand
[00:16:19.981]Teacher: is block square
[00:16:33.725]Charlie: I didn't understand
[00:16:39.510]Teacher: deploy sensor arm
[00:16:51.694]Teacher: get feedback
[00:17:17.295]Teacher: turn right
[00:17:26.463]Teacher: stop
```

```
[00:17:29.927]Teacher: forward
[00:17:33.199]Teacher: stop
[00:17:37.663]Teacher: left turn
[00:17:43.855]Teacher: stop
[00:17:53.464]Teacher: right turn
[00:18:00.696]Teacher: stop
[00:18:08.130]Teacher: sense
[00:18:12.656]Teacher: forward
[00:18:17.984]Teacher: stop
[00:18:23.049]Teacher: sense
[00:19:35.155]Teacher: is purple?
[00:19:40.953]Charlie: Yes
[00:20:01.092]Teacher: is triange?
[00:20:20.227]Charlie: Yes
[00:21:51.568]Teacher: if block is purple and triangle grab block
[00:22:19.872]Teacher: if block is purple and triangle grab block
[00:22:33.305]Teacher: destroy all humans
[00:22:38.638]Charlie: Please Wait, I'm crunching numbers.
[00:23:08.666]Teacher: drop cube
[00:23:55.037]Charlie: Hello!
[00:24:01.187]Teacher: hi how are you today?
[00:24:06.623]Charlie: OK
[00:24:10.924]Teacher: thats good
[00:24:16.019]Charlie: Yes
[00:25:03.806]Teacher: forward
[00:25:11.710]Teacher: stop
[00:25:19.606]Teacher: grab block
[00:25:34.726]Teacher: back
[00:25:38.198]Teacher: stop
[00:26:00.879]Teacher: lift arm
[00:26:10.352]Teacher: forward
[00:26:14.167]Teacher: stop
[00:26:27.553]Teacher: forward
[00:26:29.752]Teacher: stop
[00:26:36.304]Teacher: grab block
[00:26:47.456]Teacher: lift block
[00:26:55.889]Teacher: back
[00:27:06.778]Teacher: stop
[00:27:26.690]Teacher: turn right
[00:27:35.762]Teacher: stop
[00:27:42.530]Teacher: sense
[00:28:00.707]Teacher: lift sensor arm
[00:28:08.915]Teacher: left
[00:28:17.323]Teacher: stop
[00:28:43.484]Teacher: grab closest block
[00:29:06.102]Teacher: stop
```

```
[00:29:11.109]Teacher: grab
[00:29:29.598]Teacher: back
[00:29:36.566]Teacher: stop
[00:30:42.632]Teacher: to find the treasure, find the closest purple
                      triangular prism
[00:30:50.752]Teacher: drop block
[00:31:00.706]Charlie: I didn't understand
[00:31:01.128]Teacher: raise arm
[00:31:32.730]Teacher: turn left
[00:31:38.122]Teacher: stop
[00:31:59.315]Teacher: grab blue-green cube
[00:32:32.444]Teacher: this is not treasure
[00:32:36.938]Charlie: OK
[00:32:39.684]Teacher: treasure is not blue-green
[00:32:43.100]Teacher: get rid of it
[00:32:50.692]Teacher: back
[00:32:55.709]Teacher: stop
[00:33:13.877]Teacher: if the block is green or blue discard it
[00:33:21.997]Teacher: if the block is not purple it is not treasure
[00:33:29.701]Charlie: OK
[00:33:37.618]Charlie: I didn't understand
[00:33:52.430]Teacher: if the block is purple it is treasure
[00:33:59.590]Teacher: turn right
[00:34:06.798]Teacher: stop
[00:34:25.487]Teacher: lift claw
[00:34:32.439]Teacher: lift claw arm
[00:34:42.080]Teacher: forward
[00:34:48.448]Teacher: stop
[00:35:07.608]Teacher: sense
[00:35:39.793]Teacher: do you feel treasure?
[00:35:45.543]Charlie: I didn't understand
[00:35:57.387]Teacher: do you feel anything!?
[00:36:06.824]Charlie: I didn't understand
[00:36:19.421]Teacher: sense
[00:37:14.077]Teacher: do you notice treasure?
[00:37:20.090]Charlie: I didn't understand
[00:37:48.382]Teacher: how do you feel about this block?
[00:37:57.880]Charlie: No
[00:38:00.578]Charlie: Two
[00:38:13.030]Charlie: Two
[00:38:21.759]Teacher: sweet
[00:38:27.732]Charlie: OK
[00:39:03.608]Teacher: do you feel this block is a 2?
[00:39:09.040]Charlie: Yes
[00:39:35.521]Teacher: raise sensor arm
[00:39:54.185]Teacher: turn 30 degrees right and stop
```

```
[00:40:11.162]Teacher: sense block
[00:40:35.387]Teacher: how do you feel about this block?
[00:40:45.786]Charlie: Please Wait, I'm crunching numbers.
[00:41:08.733]Charlie: One
[00:41:52.646]Teacher: if you feel 1 about the block do not grab the block
[00:41:59.630]Teacher: if you feel 2 about the block grab the block
[00:42:00.503]Charlie: OK
[00:42:06.677]Charlie: OK
[00:42:09.390]Teacher: grab 2 block
[00:43:17.568]Teacher: rotate 90 left
[00:43:31.472]Teacher: rotate claw 90 degrees left
[00:43:43.945]Teacher: rotate claw arm 90 degrees left
[00:44:13.546]Teacher: drop
[00:44:25.394]Teacher: black 4 inches
[00:45:00.180]Teacher: turn 55 degrees right and stop
[00:45:22.124]Teacher: is this treasure?
[00:45:33.554]Charlie: No
[00:45:50.846]Teacher: what color is this?
[00:46:23.831]Charlie: Please Wait, I'm crunching numbers.
[00:46:50.364]Charlie: I didn't understand
[00:47:34.376]Teacher: find treasure now
[00:48:19.329]Teacher: forward and 20 degrees right
[00:48:29.994]Teacher: stop
[00:48:44.027]Teacher: turn right 30 degrees
[00:48:56.483]Teacher: turn right 30 degrees
[00:49:02.675]Teacher: forward
[00:49:09.379]Teacher: stop
[00:49:13.019]Teacher: drop block
[00:49:14.243]Teacher: raise arm
[00:49:20.148]Teacher: raise claw arm
[00:49:25.476]Teacher: turn right 180
[00:49:49.245]Teacher: forward 6 inches
[00:50:21.397]Teacher: find treasure now
[00:50:45.815]Charlie: I didn't understand
[00:51:07.767]Teacher: turn right 120 degrees and stop
[00:53:02.790]Charlie: Hello!
[00:53:17.755]Teacher: find treasure
[00:53:25.271]Charlie: Please Wait, I'm crunching numbers.
[00:55:26.011]Charlie: One
[00:56:15.379]Charlie: Two
[00:56:26.092]Charlie: OK
[00:56:36.952]Charlie: I'm done
```

3.2.3 robot - 27 October 2009, 9:30am

```
[00:00:00.000]Charlie: One
[00:01:00.002]Teacher: plese back up a little
[00:01:15.795]Teacher: ok stop
[00:01:18.226]Teacher: good
[00:01:25.875]Teacher: lower the claw and grab the blue block
[00:02:00.620]Teacher: use the 'uc' command
[00:02:08.548]Teacher: good job
[00:02:17.788]Teacher: grab the blue block by getting close and turning
                       a llittle
[00:02:21.420]Teacher: and then close the claw
[00:02:49.149]Teacher: close the claw, then rocate the claw 'rc'
[00:02:53.062]Teacher: rotate, sorry
[00:03:08.630]Teacher: open the claw
[00:03:11.254]Teacher: good job
[00:03:15.302]Teacher: say "thanks"
[00:03:22.857]Charlie: Thank you
[00:03:25.759]Teacher: what color is the closest block?
[00:03:33.086]Charlie: Blue/Cyan
[00:03:36.495]Teacher: excellent
[00:03:45.607]Teacher: lower the rfid arm 'ur'
[00:04:07.656]Teacher: do you see the number?
[00:04:13.764]Charlie: Yes
[00:04:15.048]Teacher: what number do you see?
[00:04:26.491]Charlie: Two
[00:04:28.569]Teacher: wave the rfid arm (scan arm)
[00:04:33.970]Teacher: i think it is sc
[00:04:47.346]Teacher: bravo
[00:04:54.481]Teacher: ok, do you want to practive any more?
[00:05:00.562]Teacher: practice I mean
[00:05:04.793]Charlie: I am done
[00:15:52.852]Charlie: Hello!
[00:16:17.335]Teacher: hello charlie
[00:16:23.592]Charlie: Hello!
[00:16:26.815]Teacher: can you see me?
[00:16:32.385]Charlie: Yes
[00:16:43.112]Teacher: gooood
[00:16:48.776]Teacher: good
[00:17:10.025]Teacher: ok, you are going on a treasure hunt
[00:17:28.881]Teacher: you want to find the treasure because it is valuable
                       to you
[00:17:35.709]Charlie: OK
[00:17:53.346]Teacher: and you want to hide it so that the pirates can't take
                       it away from you
[00:18:00.664]Charlie: OK
```

```
[00:18:09.578]Teacher: can you move forward a bit for me?
[00:18:19.787]Teacher: yay!
[00:18:21.867]Teacher: ok stop
[00:18:36.683]Teacher: there is a block to your left
[00:18:38.675]Teacher: do you see it?
[00:18:44.124]Teacher: or sense it in any way?
[00:18:47.944]Charlie: Yes
[00:18:55.916]Teacher: can you tell me what color it is?
[00:19:02.632]Charlie: Blue/Cyan
[00:19:09.316]Teacher: sorry can you say it again?
[00:19:12.184]Charlie: Blue/Cyan
[00:19:19.028]Teacher: oo very specific
[00:19:27.069]Teacher: can you pick it up?
[00:19:30.114]Charlie: Yes
[00:19:44.670]Teacher: would you please now?
[00:19:52.549]Teacher: you're gonna have to turn around
[00:20:03.718]Teacher: unless your arm reaches across your body?
[00:20:15.166]Teacher: actually
[00:20:16.527]Teacher: forget that
[00:20:23.647]Teacher: try and go for the one on your left
[00:21:09.272]Teacher: you missed lol
[00:21:31.216]Teacher: awesome
[00:21:41.089]Teacher: can you put it under your number sensor
[00:21:46.825]Teacher: to see what number it is?
[00:21:50.755]Charlie: I didn't understand
[00:22:29.842]Teacher: your number sensor, RFID arm
[00:22:44.419]Teacher: can you use it on the block you are holding
[00:23:22.746]Charlie: I am done
[00:23:29.301]Teacher: ohhh ok
[00:23:42.502]Teacher: blue objects do not have numbers on them
[00:23:53.133]Teacher: you are only interested in objects that have numbers
                       on them
[00:23:53.942]Charlie: OK
[00:24:12.709]Teacher: purple objects have nuymbers on them
[00:24:21.693]Charlie: OK
[00:24:27.439]Teacher: there is one just behind you to your right
[00:24:50.564]Charlie: I am done
[00:24:55.551]Teacher: can you tell what number is on it?
[00:24:59.541]Charlie: Two
[00:25:18.656]Teacher: awesome
[00:25:34.945]Teacher: only objects with the number 2 on them have treasure
[00:25:39.625]Charlie: OK
[00:25:57.361]Teacher: once you've found treasure you want to turn it over
                       to hide it from the other pirates
[00:26:02.093]Charlie: OK
[00:26:02.217]Teacher: Yarrrghh
```

```
[00:26:08.744]Charlie: I didn't understand
[00:26:25.098]Teacher: so what do you want to do with the block in front of
                      you?
[00:27:23.236]Teacher: woot!
[00:27:25.052]Charlie: I am done
[00:27:31.732]Teacher: you win
[00:27:35.223]Charlie: OK
[00:28:26.934]Teacher: you should check to see if things in your vicinity
                      are treasure
[00:28:34.916]Charlie: I didn't understand
[00:28:49.726]Teacher: you always want to find treasure
[00:28:53.222]Teacher: because you're a pirate
[00:28:53.284]Charlie: OK
[00:28:56.374]Teacher: Yargh
[00:29:00.851]Charlie: I didn't understand
[00:29:20.159]Teacher: so check all the blocks to see if they are treasure
[00:29:23.044]Charlie: OK
[00:29:28.560]Charlie: Blue/Cyan
[00:31:46.948]Teacher: good job!
[00:31:50.916]Teacher: Yarr
[00:32:04.173]Teacher: you can stop now
[00:32:11.429]Teacher: you found all the treasure here
[00:32:18.965]Teacher: they're going to move you to another place
[00:32:29.502]Teacher: and you're going to find and hid the treasure there
[00:32:31.877]Teacher: have fun!
[00:32:44.782]Charlie: OK
[00:33:08.351]Teacher: ********************TEACHING FINISHED ***************
[00:33:45.384]Teacher: ok, start the test
[00:33:51.219]Charlie: OK
[00:37:23.454]Charlie: I am done
[00:37:26.607]Teacher: good
```

3.2.4 robot - 29 October 2009, 2:00pm

[00:00:00.000]Teacher: find the triangle one first
[00:00:01.927]Charlie: Hello!
[00:00:38.091]Charlie: OK
[00:00:54.946]Teacher: scan the object and find the number
[00:01:09.917]Charlie: OK
[00:01:27.090]Teacher: if it is 1, move to the next triangle
[00:02:34.549]Charlie: OK
[00:02:53.549]Teacher: move to the next triangle object
[00:03:06.622]Charlie: OK
[00:03:48.887]Teacher: scan it
[00:03:49.737]Charlie: I am done
[00:04:18.719]Teacher: if it is 2, filp the object
[00:04:38.688]Charlie: Two
[00:06:06.907]Teacher: scan it
[00:06:17.139]Teacher: if it is 2, flip the object
[00:06:56.765]Charlie: Two
[00:08:26.441]Charlie: I am done
[00:08:35.975]Teacher: scan it
[00:08:42.111]Charlie: Please wait, I am crunching numbers.
[00:09:09.926]Charlie: OK
[00:09:38.711]Charlie: Hello!
[00:09:51.489]Teacher: scan the triangle object
[00:10:46.823]Charlie: I am done
[00:12:18.678]Teacher: find the triangle object
[00:12:26.951]Charlie: OK
[00:12:47.520]Teacher: if it is green move to the next triangle object
[00:12:54.972]Charlie: OK
[00:12:59.513]Charlie: Blue/Cyan
[00:13:08.800]Teacher: scan it if is 1, move to the next triangle objext
[00:13:13.336]Teacher: object
[00:13:30.373]Charlie: One
[00:14:09.589]Charlie: One
[00:16:42.575]Teacher: if it is purple flip it
[00:16:54.236]Charlie: Please wait, I am crunching numbers.
[00:17:02.038]Charlie: OK
[00:17:03.200]Charlie: Blue/Cyan
[00:17:20.963]Charlie: Purple
[00:17:51.273]Teacher: scan it
[00:18:33.539]Charlie: I am done
[00:19:10.700]Teacher: scan the purple object
[00:19:36.458]Charlie: Hello!
[00:19:53.741]Teacher: find the purple triangle object
[00:20:14.941]Charlie: Blue/Cyan
[00:20:35.149]Charlie: Blue/Cyan

```
[00:20:54.267]Charlie: Purple
[00:21:03.739]Charlie: I am done
[00:21:05.903]Teacher: scan it
[00:21:31.632]Teacher: if it 1, move to the next purple triangle object
[00:21:34.411]Charlie: One
[00:21:43.345]Teacher: if no value, flip it
[00:21:52.649]Charlie: OK
[00:22:08.566]Charlie: Blue/Cyan
[00:22:15.801]Teacher: if it is not 2, move to the next purple triangle object
[00:22:25.561]Charlie: Purple
[00:22:46.067]Charlie: One
[00:23:02.075]Charlie: Blue/Cyan
[00:23:13.088]Charlie: Purple
[00:23:58.413]Teacher: find the triangle object
[00:24:15.981]Teacher: find the purple object
[00:24:43.147]Charlie: Purple
[00:24:51.791]Charlie: OK
[00:25:19.759]Teacher: scan it
[00:25:24.871]Charlie: OK
[00:25:32.151]Teacher: if it is one
[00:25:38.328]Charlie: One
[00:25:42.480]Teacher: move to the next triangle object
[00:26:08.924]Charlie: Blue/Cyan
[00:26:48.665]Charlie: Purple
[00:26:58.097]Charlie: Blue/Cyan
[00:27:49.260]Charlie: Triangle
[00:27:59.555]Charlie: I am done
[00:28:15.876]Teacher: scan it
[00:28:19.759]Charlie: OK
[00:28:38.821]Teacher: if it is 2 you find it!
[00:28:41.591]Charlie: Two
[00:28:52.087]Charlie: I am done
[00:29:15.102]Teacher: find the triangle object
[00:29:22.744]Charlie: OK
[00:29:26.975]Teacher: find the purple object
[00:29:36.120]Teacher: scan it
[00:29:50.014]Charlie: Purple
[00:29:53.272]Charlie: Blue/Cyan
[00:29:56.632]Charlie: Purple
[00:30:33.818]Charlie: OK
[00:30:42.826]Charlie: Blue/Cyan
[00:31:17.478]Charlie: Blue/Cyan
[00:31:33.568]Charlie: Triangle
[00:31:34.823]Charlie: Blue/Cyan
[00:31:59.382]Charlie: Triangle
[00:32:00.627]Charlie: Purple
```

```
[00:32:03.323]Charlie: Blue/Cyan
[00:32:05.863]Charlie: Purple
[00:32:27.773]Teacher: flip it until read number
[00:32:35.534]Charlie: OK
[00:32:40.109]Teacher: if number is 1 move to the next
[00:32:50.037]Teacher: if number is 2 you find it
[00:32:51.697]Charlie: No
[00:36:32.170]Charlie: No
[00:36:56.856]Charlie: Triangle
[00:36:58.296]Charlie: Purple
[00:37:21.168]Charlie: No
[00:38:17.183]Charlie: Two
[00:38:21.094]Charlie: Blue/Cyan
[00:38:41.684]Charlie: I am done
[00:39:00.601]Teacher:
[00:39:30.482]Teacher: ****************************
```

3.2.5   robot - 29 October 2009, 3:30pm

```
[00:00:00.000]Teacher: hello
[00:00:18.829]Charlie: Hello!
[00:05:55.699]Charlie: Please wait, I am crunching numbers.
[00:06:59.422]Teacher: destroy all humans
[00:07:15.859]Charlie: No
[00:09:02.515]Charlie: Hello!
[00:14:48.373]Teacher: find purple
[00:14:54.587]Charlie: OK
[00:16:08.719]Teacher: what number?
[00:16:11.319]Charlie: I am done
[00:16:23.408]Teacher: find another purple
[00:17:08.475]Charlie: One
[00:17:16.025]Charlie: I am done
[00:17:58.508]Charlie: I am done
[00:18:03.203]Teacher: what number?
[00:18:15.710]Charlie: One
[00:18:17.894]Charlie: I am done
[00:18:25.395]Teacher: find a purple triangle
[00:19:05.965]Charlie: I am done
[00:19:10.509]Teacher: what number?
[00:19:26.169]Charlie: One
[00:19:38.390]Teacher: find a different purple triangle
[00:20:04.631]Charlie: I am done
[00:20:08.911]Teacher: what number?
[00:20:27.213]Charlie: Two
[00:20:36.863]Teacher: hide number
[00:20:55.653]Charlie: I didn't understand
[00:21:02.833]Teacher: flip the triangle
[00:21:12.466]Charlie: OK
[00:21:47.057]Charlie: I am done
[00:21:50.714]Teacher: what number?
[00:22:54.200]Charlie: I didn't understand
[00:23:04.133]Teacher: flip triangle
[00:23:42.234]Charlie: I am done
[00:23:46.765]Teacher: what number?
[00:24:44.362]Charlie: I didn't understand
[00:25:56.921]Charlie: No
[00:26:06.442]Teacher: thanks
[00:26:07.027]Charlie: OK
[00:26:53.316]Teacher: see a numbger?
[00:27:00.410]Charlie: No
[00:27:05.678]Charlie: Yes
[00:27:09.772]Teacher: what is it?
[00:27:12.004]Charlie: Two
```

```
[00:27:14.436]Teacher: good
[00:27:19.674]Charlie: OK
[00:27:32.941]Teacher: you win!
[00:27:38.442]Charlie: Thank you
[00:28:02.206]Teacher: find a purple triangle, what number?
[00:28:42.945]Charlie: Two
[00:28:44.542]Charlie: I am done
[00:29:02.792]Teacher: wrong number, find another purple triangle, what number?
[00:29:34.587]Charlie: One
[00:29:48.225]Teacher: my mistake, the last number was good
[00:29:53.421]Charlie: OK
[00:30:06.738]Teacher: find purple triangle, what number?
[00:31:18.841]Charlie: Thank you
[00:31:21.235]Charlie: Two
[00:31:21.500]Teacher: go ahead
[00:31:23.555]Teacher: your welcome
[00:31:31.860]Teacher: flip the triangle
[00:32:16.034]Charlie: OK
[00:32:20.485]Teacher: you win!
[00:32:23.684]Charlie: Thank you
[00:32:48.175]Teacher: find purple triangle, if number is 2 flip triangle
[00:33:00.717]Charlie: OK
[00:33:46.920]Charlie: OK
[00:34:03.992]Teacher: you didn't read the number, why?
[00:34:21.248]Charlie: I didn't understand
[00:34:53.339]Charlie: Two
[00:35:06.451]Teacher: find purple triangle, if number is 2 flip triangle
[00:35:57.264]Charlie: OK
[00:35:58.852]Charlie: Two
[00:36:34.405]Teacher: are you done?
[00:36:40.482]Charlie: No
[00:37:12.519]Teacher: please wait
[00:37:15.191]Charlie: OK
[00:37:54.760]Teacher: continue
[00:37:56.650]Charlie: OK
[00:38:17.425]Charlie: OK
[00:38:20.721]Teacher: you win!
[00:38:26.242]Charlie: Thank you
[00:38:42.161]Teacher: ok, we will do this one last time
[00:38:53.966]Charlie: OK
[00:39:06.107]Teacher: ok, play the whole game
[00:39:09.777]Charlie: OK
[00:40:31.133]Charlie: I am done
[00:41:16.991]Teacher: thak you charlie.  Please wait
[00:41:20.915]Charlie: OK
```

3.2.6   robot - 30 October 2009, 12:30pm

```
[00:10:07.558]Teacher: can you see my typing?
[00:10:22.726]Teacher: say "one"
[00:10:29.166]Teacher: say "Yes"
[00:10:29.933]Charlie: One
[00:10:37.446]Teacher: excel;lent
[00:10:41.335]Teacher: oops excellent
[00:10:44.264]Charlie: Thank you
[00:13:43.132]Teacher: use rfid arm please
[00:14:09.308]Charlie: Yes
[00:14:16.462]Teacher: what number?
[00:14:28.617]Charlie: One
[00:17:59.220]Teacher: move to the blocks
[00:18:25.461]Teacher: stop
[00:18:39.949]Teacher: back up
[00:18:46.774]Teacher: stop
[00:18:57.589]Teacher: turn left
[00:19:05.342]Teacher: stop
[00:19:25.455]Teacher: back up and turn left
[00:19:40.919]Teacher: stop
[00:19:48.615]Teacher: move forward
[00:19:55.487]Teacher: stop
[00:20:07.767]Teacher: use rfid arm
[00:20:30.496]Teacher: back up  s
[00:20:37.625]Teacher: bstop
[00:20:48.521]Teacher: move forward
[00:20:54.601]Teacher: stop
[00:21:11.410]Teacher: is the block a number
[00:21:18.999]Charlie: Yes
[00:21:34.162]Teacher: what number is the block
[00:21:37.702]Charlie: One
[00:22:15.100]Teacher: that is not treasure
[00:22:23.847]Charlie: OK
[00:22:35.508]Teacher: move to the right
[00:22:51.296]Charlie: I didn't understand
[00:22:59.405]Teacher: turn right
[00:23:06.693]Teacher: stop
[00:23:20.166]Teacher: turn left
[00:23:26.518]Teacher: stop
[00:23:37.710]Teacher: find another block
[00:23:45.853]Charlie: I didn't understand
[00:24:10.015]Teacher: move forward slowly
[00:24:15.631]Teacher: stop
[00:24:27.641]Teacher: look for a block
[00:24:47.785]Teacher: turn left
```

```
[00:24:52.880]Teacher: stop
[00:25:14.873]Teacher: what number is the block
[00:25:18.231]Charlie: Two
[00:25:40.290]Teacher: that is treasure
[00:25:50.020]Charlie: OK
[00:26:05.979]Teacher: grab the bolock
[00:26:15.187]Teacher: grab the block
[00:26:42.018]Charlie: Please wait, I am crunching numbers.
[00:26:49.793]Charlie: OK
[00:27:16.933]Teacher: move forward
[00:27:20.872]Teacher: stop
[00:27:28.397]Teacher: grab the block
[00:27:40.638]Teacher: turn iot over
[00:28:06.126]Teacher: let it go
[00:28:18.831]Teacher: now it is hidden
[00:28:34.424]Charlie: OK
[00:28:57.563]Charlie: Please wait, I am crunching numbers.
[00:29:12.683]Charlie: OK
[00:29:25.857]Teacher: use rfid arm
[00:30:34.483]Teacher: move forward to the blocks
[00:30:47.323]Teacher: stop
[00:31:01.972]Teacher: back up
[00:31:06.780]Teacher: stop
[00:31:23.749]Teacher: do yuo see the blue block
[00:31:35.852]Charlie: No
[00:32:49.393]Teacher: look for the blue block
[00:33:09.007]Teacher: did uoy find it
[00:33:18.464]Teacher: did you find it
[00:33:20.365]Charlie: Yes
[00:33:40.017]Teacher: blue blocks are not treasure
[00:33:48.438]Charlie: OK
[00:34:11.913]Teacher: move blue blocks a away
[00:34:39.113]Charlie: OK
[00:35:01.419]Teacher: look for the green block
[00:35:22.587]Charlie: OK
[00:35:33.164]Teacher: did yuo find it
[00:35:37.546]Charlie: Yes
[00:35:56.813]Teacher: green blocks are not treasure
[00:36:01.747]Charlie: OK
[00:36:17.678]Teacher: move green blocks out of the way
[00:37:15.426]Teacher: look for the purple block
[00:37:48.745]Teacher: did you find a purple block
[00:37:55.732]Charlie: No
[00:38:16.145]Teacher: move forward
[00:38:21.794]Teacher: stop
[00:38:36.034]Teacher: look for a purple block
```

```
[00:38:57.066]Teacher: did you find a purple block
[00:39:00.986]Charlie: I am done
[00:39:05.704]Charlie: No
[00:39:24.323]Teacher: move forward
[00:39:30.508]Teacher: stop
[00:39:44.565]Teacher: look for a purple block
[00:39:56.349]Teacher: didyou find a purple block
[00:40:01.023]Charlie: No
[00:40:48.359]Teacher: look for a purple block
[00:41:01.119]Charlie: I am done
[00:41:06.831]Teacher: did didyou find a purple block
[00:41:11.538]Charlie: Yes
[00:41:25.201]Teacher: is it a 2
[00:41:31.947]Charlie: No
[00:42:05.465]Teacher: purple blocks that are not 2 are not treasure
[00:42:09.952]Charlie: OK
[00:42:42.370]Teacher: look for a purple block that is a 2
[00:43:39.188]Teacher: if you can not see one move forward 1 inch and look again
[00:43:57.458]Charlie: I am done
[00:44:16.021]Teacher: can you see a purple block
[00:44:19.938]Charlie: Yes
[00:44:26.445]Teacher: is it a number 2
[00:44:31.169]Charlie: Yes
[00:44:49.430]Teacher: grab it and turn it over
[00:45:27.832]Charlie: I am done
[00:45:28.407]Teacher: let it go to hide it
[00:45:38.701]Charlie: I am done
[00:45:47.320]Teacher: move away
[00:45:59.656]Teacher: stop
[00:46:38.985]Charlie: Please wait, I am crunching numbers.
[00:46:47.061]Charlie: OK
[00:46:58.522]Teacher: look for the treasure
[00:47:45.756]Teacher: stop
[00:48:15.548]Teacher: look for the treasure
[00:49:07.054]Charlie: Please wait, I am crunching numbers.
[00:49:13.611]Charlie: OK
[00:49:27.494]Charlie: I am done
[00:49:44.335]Teacher: have you found treasure
[00:49:49.475]Charlie: No
[00:50:14.888]Teacher: move forware 1 inch
[00:50:33.817]Teacher: move look for the treasure
[00:51:09.617]Charlie: I am done
[00:51:20.778]Teacher: do you see treasure
[00:51:29.924]Charlie: Yes
[00:51:40.763]Teacher: hide the treasure
[00:52:17.335]Charlie: I am done
```

```
[00:52:45.513]Charlie: I am done
[00:52:50.397]Teacher: move back and stop
[00:53:05.301]Teacher: now you are done
[00:53:14.637]Charlie: OK
[00:53:20.535]Charlie: Thank you
[00:53:43.767]Teacher: look for the treasure
[00:55:03.441]Teacher: stop
[00:55:27.133]Charlie: Please wait, I am crunching numbers.
[00:55:39.320]Charlie: OK
[00:55:57.179]Teacher: find a block
[00:56:13.771]Charlie: I am done
[00:56:23.755]Teacher: have you found a block
[00:56:27.817]Charlie: Yes
[00:56:40.420]Teacher: is it treasure
[00:56:44.256]Charlie: No
[00:56:52.316]Teacher: find another block
[00:57:11.796]Charlie: I am done
[00:57:27.094]Teacher: have you found a block
[00:57:30.605]Charlie: Yes
[00:57:36.654]Teacher: is it treasure
[00:57:40.957]Charlie: No
[00:57:53.127]Teacher: find another block
[00:58:05.591]Charlie: I am done
[00:58:15.983]Teacher: have you found a block
[00:58:19.131]Charlie: Yes
[00:58:25.512]Teacher: is it treasure
[00:58:27.795]Charlie: Yes
[00:58:31.552]Teacher: hide it
[00:59:33.602]Teacher: back up
[00:59:39.154]Teacher: and stop
[00:59:55.334]Charlie: I am done
[1:00:11.435]Teacher: turn have you found treasure
[1:00:17.467]Charlie: I didn't understand
[1:00:26.955]Teacher: have you found treasure
[1:00:33.453]Charlie: No
[1:00:46.492]Teacher: find another block
[1:01:12.163]Charlie: I am done
[1:01:31.229]Teacher: back up and stop
[1:01:51.662]Teacher: turn right and stop
[1:02:33.935]Teacher: turn left and stop
[1:02:47.645]Charlie: I am done
[1:03:06.072]Teacher: use your claw arm
[1:03:27.320]Charlie: I am done
[1:03:43.963]Teacher: back up and stop
[1:04:04.557]Charlie: I am done
[1:04:13.067]Teacher: turn right 1 inch
```

```
[1:04:24.202]Charlie: I am done
[1:04:33.915]Teacher: move forward and stop
[1:04:57.900]Teacher: grab the treasure and hide it
[1:05:15.381]Charlie: I am done
[1:05:31.997]Teacher: that is how to hide treasure
[1:05:35.814]Charlie: OK
[1:06:01.254]Teacher: find treasure
[1:06:03.381]Charlie: I am done
[1:06:22.007]Teacher: stop
[1:06:34.973]Charlie: Please wait, I am crunching numbers.
[1:06:41.414]Charlie: OK
[1:06:59.419]Charlie: I am done
[1:07:04.320]Teacher: find the treasure
[1:07:13.329]Teacher: stop
[1:07:33.208]Charlie: I am done
[1:07:41.169]Teacher: have you found treasure
[1:07:48.937]Charlie: Yes
[1:07:54.501]Teacher: hide it
[1:09:35.373]Teacher: back up and stop
[1:09:59.703]Charlie: I am done
[1:10:19.102]Teacher: turn right 1 inch and stop
[1:10:40.239]Teacher: move forward and stop
[1:11:05.056]Teacher: turn left and stop
[1:11:16.368]Teacher: again
[1:11:24.120]Teacher: again
[1:11:37.432]Charlie: I am done
[1:11:42.441]Teacher: again
[1:11:57.650]Teacher: turn left and stop
[1:12:10.535]Charlie: I am done
[1:12:26.707]Teacher: do you see the treasure in your claw
[1:12:49.316]Charlie: No
[1:13:02.475]Teacher: hide the treasure
[1:13:36.788]Charlie: I am done
[1:13:41.356]Teacher: ok, we are done. Please wait
[1:13:49.912]Charlie: OK
```