Online Appendix of "The Emergence of Language Differences in Artificial Codes"

Fuhai Hong* Xiaojian Zhao†

February 12, 2017

*Division of Economics, Nanyang Technological University. Email: fhhong@ntu.edu.sg.

†Department of Economics, The Hong Kong University of Science and Technology. Email: xjzhao81@gmail.com

Appendix A: English Translation of Experimental Instructions - Treatment O

INSTRUCTION

Welcome to the experiment. This experiment studies decision making between individuals. In the following two hours or less, you will participate in 30 rounds of decision making. Please read the instructions below carefully; the cash payment you will receive at the end of the experiment depends on how well you make your decisions according to these instructions. Please turn off your mobile phone and any other electronic devices. Communication of any kind with other participants is not allowed.

Your Role and Decision Group

Half of the participants will be randomly assigned the role of Member A and the other half the role of Member B. Your role will remain fixed throughout the experiment. Prior to the first round, one Member A will be paired with one Member B to form a group of two. The group formation will remain fixed for all 30 rounds. That is, you will interact with only one participate throughout the entire study. The two members in a group make decisions that will affect their rewards in the round.

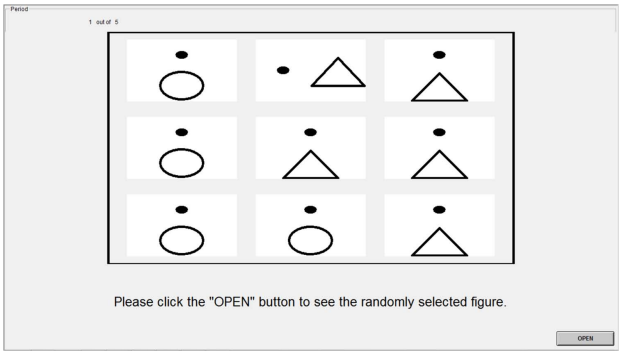
Your Decision in Each Round

You will be presented with a box having nine figures on your screen. Among the nine figures, four of them are $\overset{\bullet}{\triangle}$, another four of them are $\overset{\bullet}{\bigcirc}$, and the remaining one figure is $\bullet\ \triangle$ as you see in Figure 1(a) or 2(a). In each round and for each individual, the positions of these figures are randomly determined.

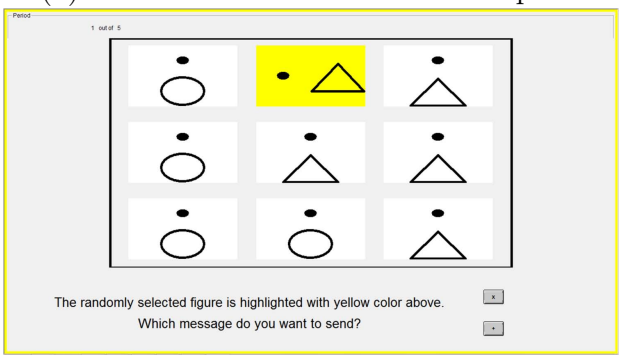
In each round and for each group, the computer will randomly select one figure in the box. Each figure in the box has equal chance to be selected. The selected figure will be revealed to Member A only. Member B, without seeing the selected figure, will have to guess what the figure is.

Member A's Decision

In each round, you will be presented with a box having nine figures on your screen as explained above. If you click the "open" button in the right-bottom corner of your screen, then you will see that one of the figures is highlighted with yellow color on your screen (see Figure 1(b)). The highlighted figure is the randomly selected figure for your group.



(a) Member A's Screen: Before "Open"



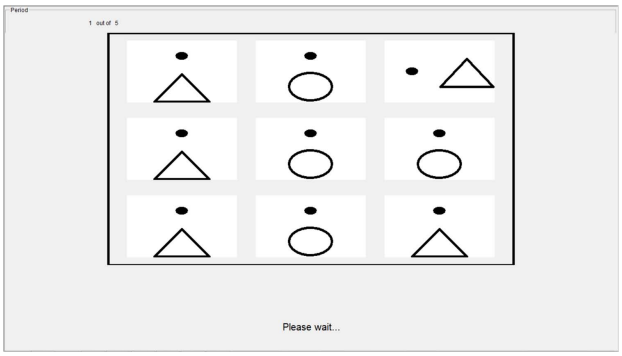
(b) Member A's Screen: After "Open"

Figure 1: Screen Shots

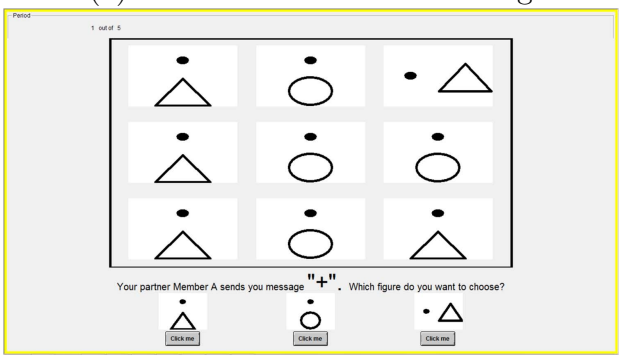
After seeing the randomly selected figure, you will be asked to send one of two messages "+" and "×". You will see two buttons, each of which corresponds to either message, vertically located on your screen. The order (or the vertical position) of the two message buttons is randomly determined for each individual subject in each round.

Once you click one of the message buttons, your decision in the round is completed and your message will be transmitted to your paired Member B, who will then be asked to guess the randomly selected figure.

Member B's Decision



(a) Member B's Screen: Waiting



(b) Member B's Screen: Figure Choices

Figure 2: Screen Shots

In each round, you will be presented with a box having nine figures on your screen as explained above. You will be waiting for the message from your paired Member A. Once your paired member A finishes making his/her message choice, you will see Member A's message on your screen. Then you will be asked to choose one figure out of three figures $\begin{matrix}\bullet & \\ & \triangle\end{matrix}$, $\begin{matrix}\bullet & \\ & \bigcirc\end{matrix}$, and $\bullet\ \triangle$.

Here are more details about the procedure for your figure choice. At the bottom of your screen (see figure 2(b)), you will be presented with three figures, each of which has the "Click me" button below. The horizontal positions of the three figures are randomly determined for each individual in each round. You can press the "Click me" button right below each figure to choose the figure. Once you choose one of the figures by clicking the "Click me" button, your decision in the round is completed.

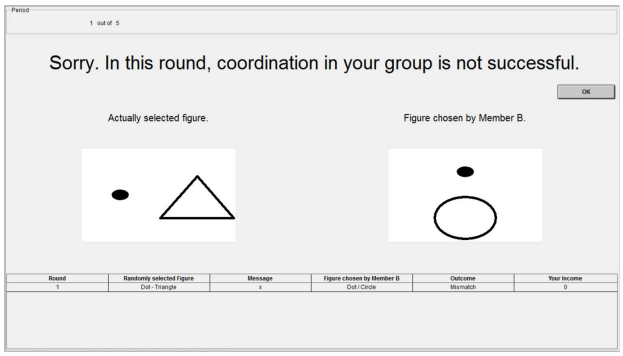
Your Reward in Each Round

Your reward in the experiment will be expressed in terms of experimental currency unit (ECU). In each round, you will receive 3 ECU if the randomly selected figure is

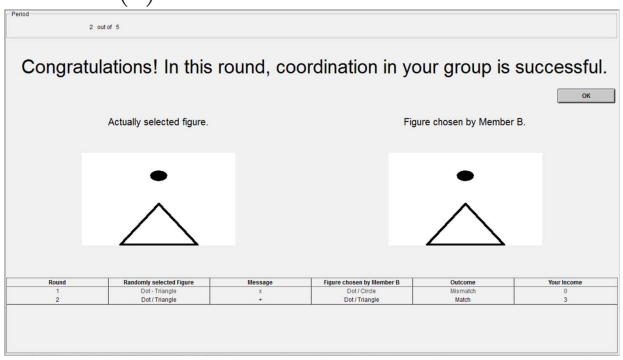
matched with the figure chosen by Member B in your group. If there is a mismatch between the two figures, then you will receive 0 ECU.

Information Feedback

At the end of each round, the computer will provide a summary for the round: which figure was selected and revealed to Member A, Member A's message, Member B's figure choice, whether or not your group has successful coordination in the round, and your total income in ECU term.



(a) Outcome Screen: Failure



(b) Outcome Screen: Success

Figure 3: Screen Shots

Figure 3 is an example of the screen for information feedback. At the bottom of the screen, you will be presented with a "history table" that shows summary of all previous rounds. In the table, we use the symbol '/' to indicate the vertical arrangement and the symbol '−' to indicate the horizontal arrangement. That is, "Dot / Triangle" represents $\begin{matrix}\bullet\\ \triangle\end{matrix}$, "Dot / Circle" represents $\begin{matrix}\bullet\\ \bigcirc\end{matrix}$, and "Dot − Triangle" represents $\bullet\ \triangle$.

Your Cash Payment

At the end of the experiment, the sum of ECU you earned in all 30 official rounds will be converted into cash at an exchange rate of 1/3 Renminbi Yuan per ECU. The cash payment at the end of the study will be this cash amount plus a 5 Renminbi Yuan show-up fee. Precisely,

Your total cash payment = Renminbi Yuan [The sum of ECU in all 30 rounds / $3 + 5$]

Quiz and Practice

To ensure your understanding of the instructions, we will provide you with 2 practice rounds. The practice rounds are part of the instructions which are not relevant to your cash payment; its objective is to get you familiar with the computer interface and the flow of the decisions in each round.

Once the practice rounds are over, the computer will tell you "The official rounds begin now!" You will be randomly assigned the role of either Member A or Member B, which will not change during the 30 official rounds.

Administration

Your decisions as well as your monetary payment will be kept confidential. Remember that you have to make your decisions entirely on your own; please do not discuss your decisions with any other participants.

Upon finishing the experiment, you will receive your cash payment. You will be asked to sign your name to acknowledge your receipt of the payment. You are then free to leave.

If you have any question, please raise your hand now. We will answer your question individually. If there is no question, we will proceed to the quiz.

Appendix B: Figure-Message Mappings for Each Group

Note: This appendix shows the figure-message mapping of the sender for each group. We show the mappings for the last 20 periods. In the table below, SxGy denotes Group y in Session x, with the rate of successful communication for all figures in the last 20 periods in parentheses; the number under each figure-message combination in the table shows the number of occurrences of that figure-message combination in the last 20 periods.

Table 1: Figure-Message Mapping: Treatments O and R

Treatment O	m	Group	• △	• ◯	• △	Group	• △	• ◯	• △
	+	S1G1	8		3	S1G2	8		1
	×	(0.85)		9		(0.95)		11	
	+	S1G3		9	5	S1G4	10		
	×	(0.8)	6			(0.85)		7	3
	+	S1G5		10		S1G6	12		1
	×	(0.9)	8		2	(0.95)		7	
	+	S2G1	10			S2G2		14	
	×	(0.9)		8	2	(0.9)	5		1
	+	S2G3	13		1	S2G4		10	
	×	(0.95)		6		(0.9)	8		2
	+	S2G5	9		1	S2G6		6	
	×	(0.95)		10		(0.9)	13		1
	+	S6G1	6		3	S6G2	8		4
	×	(0.85)		11		(0.8)		8	
	+	S6G3	5	4	2	S6G4	9		1
	×	(0.25)	5	3	1	(0.95)		10	
	+	S6G5		11		S6G6	11		2
	×	(0.95)	8		1	(0.8)		7	
	+	S6G7	9		2	S6G8	8		3
	×	(0.85)		9		(0.85)		9	
	+	S8G1		5		S8G2	7		4
	×	(0.85)	12		3	(0.8)		9	
	+	S8G3		11	2	S8G4		8	
	×	(1)	7			(0.8)	8		4
	+	S8G5		10	5	S8G6	7		1
	×	(0.75)	5			(0.9)		12	
	+	S8G7	8			S8G8		8	
	×	(0.95)		11	1	(0.9)	10		2
Treatment R	m	Group	• △	• ◯	• △	Group	• △	• ◯	• △
	+	S3G1	11	1		S3G2	10	3	
	×	(0.95)			8	(0.85)			7
	+	S3G3			8	S3G4			10
	×	(0.85)	9	3		(0.9)	8	2	
	+	S4G1	10	4		S4G2	2	1	
	×	(0.8)			6	(0.9)			17
	+	S4G3	4	2		S4G4		1	8
	×	(0.9)			14	(0.95)	11		
	+	S5G1		3	8	S5G2	11	5	
	×	(0.65)	7	2		(0.65)			4
	+	S5G3		3	11	S5G4			9
	×	(0.8)	6			(0.8)	9	2	
	+	S7G1		3	6	S7G2	11		
	×	(0.85)	11			(1)			9
	+	S7G3	10			S7G4			4
	×	(0.95)		1	9	(0.9)	14	2	
	+	S7G5	11	3		S7G6	11		
	×	(0.8)			6	(0.95)			9
	+	S7G7	11			S7G8	8	2	
	×	(0.85)		3	6	(0.9)			10
	+	S9G1	9			S9G2	10	2	
	×	(0.95)		1	10	(0.9)			8
	+	S9G3			11				
	×	(1)	7	2					