This is a reformatted version of the survey shown to participants in the study on legibility of light expressions.

Note: Individual questions were shown on separate pages (except for background questions); participants could not go back once they answered a question.

# **Explaining States and Actions of an Office Robot**

Researchers at Carnegie Mellon University are interested in understanding how robotics experts and novices explain actual robot behavior.

We will ask you to answer a series of questions about some videos and capture your explanations of robot behavior. The survey you will be filling out will take around 20 minutes to complete. You will earn a 5\$ Amazon Gift card for completing the survey in a reasonable manner (no random clicking). You will only be allowed to fill the survey once.

#### **Instructions:**

You will watch videos of robots moving around in the environment and answer questions after each video. You can watch the videos as many times as you would like. You can stop this study at any time at no cost to you, but **we will only pay participants who finished the survey with reasonable effort** (no random answers, etc). Please direct any questions you have to Stephanie Rosenthal:

Stephanie Rosenthal, Principal Investigator Software Engineering Institute Carnegie Mellon University Collaborative Innovation Center 2325 Pittsburgh PA 15213 412-268-3834 srosenthal@sei.cmu.edu



There are 55 questions in this survey

#### **Introduction**

[]First we would like to check that your web browser is set up properly to view the videos. Please tell us what word this video displays. Please write your answer here:

PLEASE READ the text below carefully as it will help you answer the questions in this survey.

The robot filmed in the videos of this survey is a collaborative service robot named CoBot. CoBot is able to do the following:

- -Move around while avoiding obstacles
- -Go to a certain location in a building
- -Carry objects in its basket from one place to another (but has no arms to manipulate them)
  - -Accompany a person from one place to another

CoBot moves around autonomously and knows the full map of the building. It can even go on elevators to service multiple floors. It is able to overcome its limitations (for example having no arms to manipulate objects) by asking humans for help. CoBot mainly uses a touch screen for interaction but it also understands speech. Finally, it can access the Internet when needed.

Please press "Next" when you're ready to start.

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\*

\*\*\*\*\*\*

#### [Video shown at <a href="https://youtu.be/2YXbngwnjEk">https://youtu.be/2YXbngwnjEk</a>]

#### In the video above, what is the robot doing? \*

Please choose **only one** of the following:

- Taking the person to a specific destination
- Wandering around the corridors with no specific purpose
- Avoiding the person behind it

**[]** \*

	1 - Not	3 - 5			5 -				
	confident	2 - Slightly	Moderately	4 - Highly	Extremely				
	at all	confident	confident	confident	confident				
How									
confident are you about your choice? Choose the number that best represents your confidence level.	0	0	0	0	0				
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-Accompar	ny a person from	one place to another	r						
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request?									
_	only one of the fo								
_	_	ching the web for th							
_		nd the person's spe	ech						
O The robot									
	is malfunctionin	g							
[] *									
Please choose		sponse for each item	:						
	1 - Not		3 -		5 -				
	confident	2 - Slightly	Moderately	4 - Highly	Extremely				
	at all	confident	confident	confident	confident				
How									
confident	0	0	0	0	0				
are you		_	-	_					

about your choice? Choose the number that best represents your confidence level.

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\*

\*\*\*\*\*\*

#### [Video at <a href="https://youtu.be/wcP-q4HUFqM">https://youtu.be/wcP-q4HUFqM</a>]

#### In the video above, what is the robot's state? \*

Please choose **only one** of the following:

•	OCharging
•	Oldle
•	O Turned off
•	OBlocked by obstacles around it
	<b>[]</b> *

	1 - Not confident at all	2 - Slightly confident	3 - Moderately confident	4 - Highly confident	5 - Extremely confident
How confident are you about your choice? Choose the number that best represents	0	0	0	0	0

your
confidence
level

R	1	N
		17

**************************************	INFORMATION	ON

COBOT\*

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#### \*\*\*\*\*

#### [Video at <a href="https://youtu.be/BbsFjW5S8yc">https://youtu.be/BbsFjW5S8yc</a>]

#### In the video above, why did the robot stop? \*

Please choose only one of the following:

- The robot recognizes the person, who was expecting it
- O The robot sees the person as an obstacle
- O The robot needs help from the person
- The robot is inviting the person to use its services

ı	_	1	*

Please choose the appropriate response for each item:

	l - Not confident at all	2 - Slightly confident	3 - Moderately confident	4 - Highly confident	5 - Extremely confident
How confident are you about your choice? Choose the number that best represents your confidence level.	0	0	0	0	0

#### B<sub>2</sub>N

**************************************	INFORMATION	ON
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\*

#### [Video at <a href="https://youtu.be/JTKscqbzoLI">https://youtu.be/JTKscqbzoLI</a>]

In	the	video	above,	why	did	the	robot	stop?	*

	riease choose <b>only one</b> of the following.
•	O The robot is trying to observe how the two people interact to gain some knowledge
	The reserve my ing to esserve new the two people interact to gain series throwing

- The robot sees the people as obstacles
- The robot needs help from the people
- The robot is inviting the people to use its services

Please choose the appropriate response for each item:

	1 - Not	3 -			5 -	
	confident at all	2 - Slightly confident	Moderately confident	4 - Highly confident	Extremely confident	
How confident are you about your choice? Choose the number that best represents your confidence level.	0	0	0	0	0	

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multiple floors asking humans it can access th	s. It is able to over for help. CoBot the Internet when saveners.	vercome its limitation mainly uses a touch needed.	full map of the buildions (for example have screen for interaction  ***********************************	ring no arms to man but it also understa	nipulate objects) by ands speech. Finally,
[Video a	nt <u>https:/</u>	/youtu.be/	<u> OLT-Oqvv6S</u>	<u>E</u> ]	
Please choose     The robot     The robot     The robot     The robot     The robot	only one of the form is blocked by and it is "thinking" about its waiting to accompany to the control of the co	ollowing: n obstacle out its next step company someone		*	
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	confident at all	2 - Slightly confident	Moderately confident	4 - Highly confident	Extremely confident
How confident are you about your choice? Choose the number that best represents	0	0	0	0	0

#### W<sub>1</sub>N

your confidence level.

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#### [Video at <a href="https://youtu.be/NAbtWtVTvw8">https://youtu.be/NAbtWtVTvw8</a> ]

In the vio	deo above,	what is the	robot's state	?	
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r lease crioose	1 - Not	sponse for each item	3 -		5 -
	confident at all	2 - Slightly confident	Moderately confident	4 - Highly confident	Extremely confident
How confident are you about your choice? Choose the number that best represents your confidence	0	0	0	0	0
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COBOT****		*******		RMATION	ON

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\*\*\*\*\*\*\*

#### [Video at <a href="https://youtu.be/ZUeR-yq-gyE">https://youtu.be/ZUeR-yq-gyE</a>]

#### In the video above, what is the robot doing? \*

Please choose only one of the following:

- It is waiting for someone to put something in its basket
- Olt is idle
- O It is waiting for its next task

		sponse for each item			~
	1 - Not confident at all	2 - Slightly confident	3 - Moderately confident	4 - Highly confident	5 - Extremely confident
How confident are you about your choice? Choose					
the number that best represents your confidence level.	0	0	0	0	0
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-Go to a ce -Carry obje -Accompa: CoBot moves a multiple floors asking humans it can access th ************************************	und while avoiding ertain location in a sects in its basket in its basket in around autonomous. It is able to over a for help. CoBot the Internet when its extraction in the internet when it is a section in the internet when its extraction in thex	ng obstacles a building from one place to an one place to anothe usly and knows the fercome its limitatio mainly uses a touch needed. *********************************	nother (but has no arr r Full map of the buildins (for example hav screen for interaction	ns to manipulate the ng. It can even go or ving no arms to ma n but it also understa	em) n elevators to ser nipulate objects ands speech. Fina
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	1 - Not		3 -		5 -
	confident	2 - Slightly	Moderately	4 - Highly	Extremely
	at all	confident	confident	confident	confident
How					
confident are you about your choice? Choose the number that best represents your confidence level.	0	0	0	0	0
	**************************************	MINDER: ********		RMATION	ON
			ollaborative service r	obot named CoBot.	CoBot is able to de
-Go to a ce -Carry obje		a building	other (but has no arr	ms to manipulate the	em)
multiple floors asking humans it can access th	s. It is able to over a for help. CoBot and the Internet when the same are same as the same are same as the same are same as the same are	rercome its limitation mainly uses a touch needed.	full map of the buildins (for example have screen for interaction	ving no arms to man n but it also understa	nipulate objects) by ands speech. Finally
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_	the person behir	nd it			
[] *	the appropriate	ananga far acab ita			
Please choose		sponse for each item			5
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	confident	2 - Slightly	Moderately	4 - Highly	Extremely
	at all	confident	confident	confident	confident
How confident are you	0	0	0	0	0

about your choice? Choose the number that best represents your confidence level.

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\*\*\*\*\*\*

#### [Video at <a href="https://youtu.be/Oe\_hfNoVjTA">https://youtu.be/Oe\_hfNoVjTA</a> ]

## In the video above, why isn't the robot answering the person's request? \*

Please choose **only one** of the following:

The robot is thinking/searching the web for the answer

The robot didn't understand the person's speech

The robot is off

The robot is malfunctioning

[] \*

	1 - Not		3 -		5 -
	confident at all	2 - Slightly confident	Moderately confident	4 - Highly confident	Extremely confident
How confident are you about your choice? Choose the number	0	0	0	0	0

that best represents your confidence level.

|--|

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\*

\*\*\*\*\*\*

level.

#### [Video at <a href="https://youtu.be/9LPo8ATMLu4">https://youtu.be/9LPo8ATMLu4</a>]

Please choose	only one of the fo	ollowing:	robot's state	? *	
[] *					
Please choose		sponse for each item			~
	1 - Not confident at all	2 - Slightly confident	3 - Moderately confident	4 - Highly confident	5 - Extremely confident
How confident are you about your choice? Choose the number that best represents your confidence	0	0	0	0	0

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D	_	

**************************************	INFORMATION	ON
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#### [Video at <a href="https://youtu.be/HJLvLr5R1wY">https://youtu.be/HJLvLr5R1wY</a>]

In	the	video	above,	why	did	the	robot	stop?	*
----	-----	-------	--------	-----	-----	-----	-------	-------	---

Please choose <b>only one</b> of the following:	_	
The robot recognizes the person, who was expecting it		

- O The robot sees the person as an obstacle
- O The robot needs help from the person
- The robot is inviting the person to use its services

-	-	4
ı	ı	ጥ

Please choose the appropriate response for each item:

	onfident at all	2 - Slightly confident	Moderately confident	4 - Highly confident	5 - Extremely confident
How confident are you about your choice? Choose the number that best represents your confidence level.	0	0	0	0	0

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\*\*\*\*\*\*

#### [Video at <a href="https://youtu.be/THs54tfTww">https://youtu.be/THs54tfTww</a>]

In the video above, why did the robot	t stop? *	* *
---------------------------------------	-----------	-----

Please choose only	one of	the	following:
--------------------	--------	-----	------------

- The robot is trying to observe how the two people interact to gain some knowledge
- The robot sees the people as obstacles
- O The robot needs help from the people
- The robot is inviting the people to use its services

#### [] \*

Please choose the appropriate response for each item:

	1 - Not		3 -		5 -
	confident at all	2 - Slightly confident	Moderately confident	4 - Highly confident	Extremely confident
How confident are you about your choice? Choose the number that best represents your confidence level.	0	0	0	0	0

#### B3L

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********  [Video a  In the vic *  Please choose	thtps:// leo above, leo above, only one of the form is blocked by an is "thinking" about is waiting to accordance its des	why did the  llowing: n obstacle out its next step company someone	to an office		******
	1 - Not	.,	3 -		5 -
	confident at all	2 - Slightly confident	Moderately confident	4 - Highly confident	Extremely confident
How confident are you about your choice? Choose the number that best represents your confidence level.	0	0	0	0	0
COBOT***** The robot films the following: -Move arou -Go to a ce -Carry obje	ed in the videos of the control of t	**************************************	** bllaborative service r nother (but has no arr		

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\*\*\*\*\*\*

#### [Video at <a href="https://youtu.be/V-L5wv8EhH8">https://youtu.be/V-L5wv8EhH8</a>]

In the video above, what is the robot's state?

\*

Waiting for Out of batt	ery or safety since it	elp pressing the ele	evator button detect metal surface ingoing and outgoin		evators
Please choose the		sponse for each item			
	1 - Not confident at all	2 - Slightly confident	3 - Moderately confident	4 - Highly confident	5 - Extremely confident
How confident are you about your choice? Choose the number that best represents your confidence level.	0	0	0	0	0
COBOT****** The robot filme the following: -Move arou -Go to a cer -Carry object	d in the videos of the distribution of the dis	**************** of this survey is a cong obstacles a building	** bllaborative service r nother (but has no arr		
multiple floors. asking humans it can access the	It is able to over for help. CoBot is a linear term of the linear term	ercome its limitation mainly uses a touch needed.	full map of the building (for example have screen for interaction ************************************	ring no arms to man but it also understa	nipulate objects) by ands speech. Finally,
[Video at	t <u>https://</u>	/youtu.be/	B23MeZMiG	<u>qo</u> ]	
Please choose of the list is waiting of the list is waiting of the list was trying trying trying trying trying trying trying t	only one of the forget for someone to get for its next tasting to navigate the	o put something in	but got stuck in the		

	1 - Not		3 -		5 -
	confident	2 - Slightly	Moderately	4 - Highly	Extremely
	at all	confident	confident	confident	confident
How					
confident are you about your choice? Choose the number that best represents your confidence level.	0	0	0	0	0
	*************************	MINDER: ********		RMATION	ON
			ollaborative service r	obot named CoBot.	CoBot is able to de
-Go to a ce -Carry obje		a building	other (but has no arr	ms to manipulate the	em)
multiple floors asking humans it can access th	s. It is able to over a for help. CoBot and the Internet when the same are same as the same are same as the same are same as the same are	ercome its limitatio mainly uses a touch needed.	full map of the buildins (for example have screen for interaction	ving no arms to man n but it also understa	nipulate objects) by ands speech. Finally
[Video a	t https://	/voutu.he/l	HghwlEw7C	FY 1	
In the vic	leo above,	_	obot not mov	_	e person has
Please choose O It is waitin O It has not O It is low o O It is trying	hing to do n battery	ollowing: to confirm the task e room but the door			
[] *					
Please choose		sponse for each item			~
	1 - Not	0 01: 1.1	3 -	4 11' 11	5 -
	confident	2 - Slightly	Moderately	4 - Highly	Extremely
	at all	confident	confident	confident	confident
How confident are you	0	0	0	0	0

about your
choice?
Choose
the
number
that best
represents
your
confidence
level.

### **Background Information**

#### []Email address (won't be used or recorded except for payment) \*

Please write your answer here:

#### []Age \*

Only numbers may be entered in this field.

Please write your answer here:

#### []Gender \*

Please choose **only one** of the following:

- O Male
- O Female
- Other

#### []Country \*

Please write your answer here:

#### [10ccupation \*

Please write your answer here:

## []Computer usage per week \* Please choose only one of the following:

- O < 10 hours</li>
- O < 20 hours
- 0 < 30 hours
- O < 40 hours
- O > 40 hours

## []Which is your dominant hand? \* Please choose only one of the following:

- Q Right
- OLeft
- O Ambidextrous

### []Are you color blind? \*

Please choose **only one** of the following:

- O Yes
- O No

#### []Are you fluent in English? \*

•	Please choose <b>only one</b> of the following:  O Yes
•	○ No
	[]
	Do you agree with the following statement?
	"I am experienced with robots." *
•	Please choose only one of the following: Strongly Agree Somewhat Agree Neither Agree nor Disagree Somewhat Disagree Strongly Disagree []Have you seen robots in person before? If yes, please explain. * Please write your answer here:
	[]Have you seen CoBot before (in person or in videos)? Please explain. * Please write your answer here:
	[] Do you agree with the following statement? "The robot was malfunctioning." *
•	Please choose only one of the following:  Strongly Agree Somewhat Agree Neither Agree nor Disagree Somewhat Disagree Strongly Disagree
	Do you agree with the following statement?
	"I trust this robot."
• • • • •	Please choose only one of the following:  Strongly Agree Somewhat Agree Neither Agree nor Disagree Somewhat Disagree Strongly Disagree  I]
	Do you agree with the following statement? "I trust robots (in general)." *
	Please choose <b>only one</b> of the following:

•	<ul> <li>Strongly Agree</li> <li>Somewhat Agree</li> <li>Neither Agree nor Disagree</li> <li>Somewhat Disagree</li> </ul>
•	O Strongly Disagree
	Do you agree with the following statement?  "After watching these videos, I will not trust robots as much as I did before."  *
•	Please choose <b>only one</b> of the following:  Strongly Agree  Somewhat Agree  Neither Agree nor Disagree  Somewhat Disagree  Strongly Disagree
	Thanks for taking part in this study. We appreciate your honest input. After we check that you have put reasonable effort in the completion of this survey, you will be contacted by email within a week for your

earned 5\$ Amazon gift card.

Feel free to contact Stephanie Rosenthal (<a href="mailto:srosenthal@sei.cmu.edu">sei.cmu.edu</a>, 412-268-3834) if you have any questions or concerns. Have a nice day!

11-30-2015 - 10:33

Submit your survey.
Thank you for completing this survey.