BEHESHTI TEAM POSTER

BY: ADNAN HAMEDSOLTANI

Detection of Highest Obedience of American Cockroach via Vocal Commands

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ABSTRACT

According to the probes done before (R. Holzer, 1997), American cockroach can be controlled by the electrical stimulation. The goal in this project is to control the movement of the cockroach via vocal commands and furthermore, find the best condition for having the highest level of the obedience of cockroach. First aim was followed by the cockroach surgery and implanting an electrode to each antenna. Then, by connecting the voice recognition module to the arduino UNO and programming, the 'right' and 'left' voices were trained, so that if any identical voice was told in the vicinity of the microphone of the module, the specific outputs of arduino would produce electricity. Now, the output relevant to the 'right' command was connected to the electrode of the left antenna and vice versa. Then, we stimulated the American cockroach by the mooted way in two conditions that one was the habitat of the cockroach and another was different in the temperature. Moreover, the experiment was repeated with conditions differing in the luminous intensity. Detecting that altering temperature and the luminous intensity from the magnitudes existing in the normal habitat of the cockroach decreases its obedience, in the third experiment both of them were converted. In all of the experiments, the angles of the rotation of cockroach were compared. Analyzing the data by t-test done, our alternative hypothesis that was the more obedience of cockroach in its own habitat was accepted at 80% confidence in the first experiment, 75% confidence in the second and 90% confidence in the third one.

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INTRODUCTION

The goal in this project is to control the movement of the cockroach via vocal commands and furthermore, find the best condition for having the highest level of the obedience of cockroach. First, it is needed to implant electrodes on the cockroach and then train the vocal commands by programming and perform the main experiments.

SURGERY & PROGRAMMING

First, it is needed to anesthetize the cockroach by placing it in a cup including water and ice (Takahito Jomori, 1992). Then, the pin headers can be stuck on the pronotum. Now, it is the time to anesthetize the cockroach again and after that, cut the left antenna and put the left electrode in it. Then we should add the super glue and park the electrode again inside the antenna. By repeating the anesthetization, the process cited above will be repeated for the right antenna of the cockroach too.

Now the activities relative to the voice recognition module will be commenced. Also, arduino UNO was opted to be used in our project. By connecting arduino to the computer and module, voices can be trained to the arduino. The training occurs by programming (Julien Bayle, 2013; Michael Margolis, 2012) in the software of arduino installed in the computer. Telling "right" in the vicinity of the microphone of the module and repeating it for verification, we can train the voices and after training, if the voice "right" is told near the microphone, a special output from arduino will produce electricity. The process clarified, will be repeated to the voice "left" too.

Now, due to be sure of the accuracy of the programming, we connected two LED lamps to two output wires of arduino. The lamps should light while telling "right" or "left". By examining them, The lamps were lighted just twice from 5 times of the examination that each time one of the vocal commands of right or left were told. In order to reform this failure, we captured the vocal commands and by displaying them, programming was repeated. Then, examination was performed again and we got 5 true responses from 5 times that the vocal commands had been displayed. Then, the output relevant to the "right" command was connected to the electrode of the left antenna and vice versa.

Experiments

Each experiment included 2 conditions (places) that one was the habitat of the cockroach and another was a place differing in a factor. First experiment had two places that one was the habitat of animal that had a temperature of 301 K (Bassett, 2012) and another was an identical place differing only in temperature that was 288 K.

Second experiment had two places differing in the luminous intensity. First place was darker (Hamman, 1988) and second one had more light intensity. Third experiment was done for measuring the effect of both of the factors mooted in one place. It had been made from two places too. One was darker and 301 K and another was brighter and 288 K.

We stimulated cockroach in each place for several times with pauses by the mentioned way and capturing video by a non-moving camera, the angles of the rotation of cockroach were written. The gauge for calculating the angles was the rotation of an imaginary line dividing the cockroach to the right and left halves.

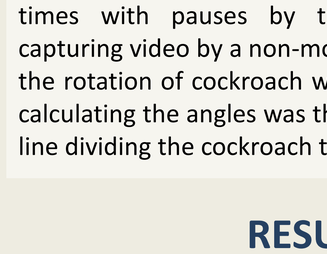
RESULTS

The t-test work was utilized for analyzing the data. In all of the experiments our alternative hypothesis was the more obedience of cockroach in the first condition that was the habitat of the animal and the null hypothesis was the equal obedience of cockroach in two conditions.

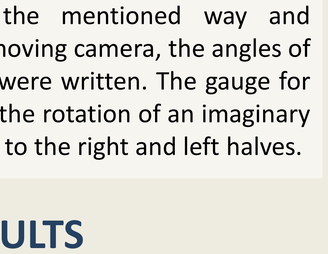
The angles in all of the experiments were written and diverse values were calculated for each one. In the first experiment, the standard deviation was 7.067 for the first and 7.252 for the second place. The pooled variance was 51.267 and calculated t-value was 0.9057, so the null hypothesis was rejected and alternative hypothesis was accepted at 80% confidence.

In the second experiment, the standard deviation was 7.067 for the first and 6.691 for the second place. The pooled variance was 47.356 and calculated t-value was 0.7472, so the null hypothesis was rejected and alternative hypothesis was accepted at 75% confidence.

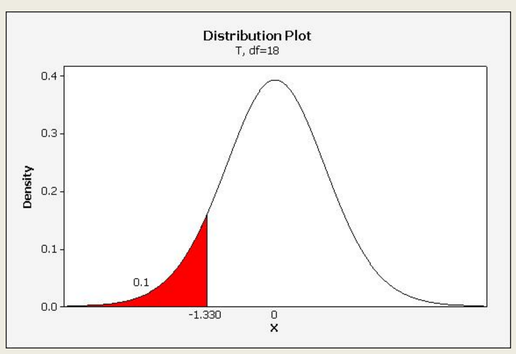
In the third experiment, the standard deviation was 7.067 for the first and 7.252 for the second place. The pooled variance was 51.267 and calculated t-value was 0.9057, so the null hypothesis was rejected and alternative hypothesis was accepted at 90% confidence.



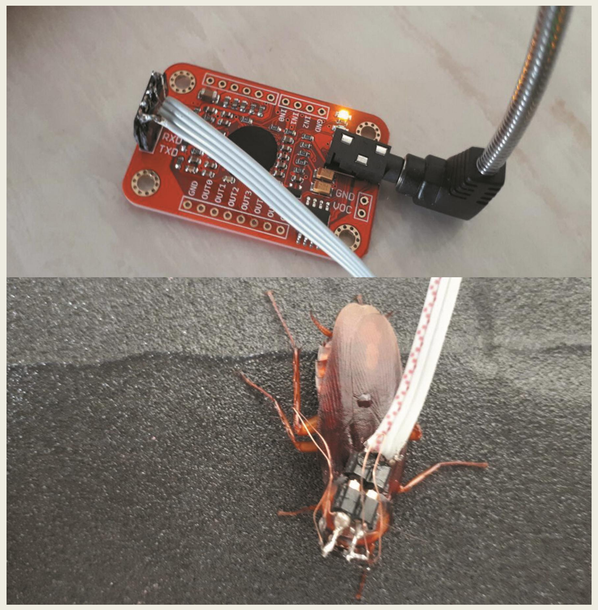
Function 1. First experiment



Function 2. Second experiment



Function 3. Third experiment



CONCLUSIONS

We took result from this project that the most obedience of American cockroach exists in an environment similar to its own habitat and for having the maximum obedience of the cockroach, the experiments should be performed in a fairly dark place with a lower luminous intensity that its temperature is 301 K. These results can help the next correlated experiments in order to take better and more precise results.

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