IEEE CIS STUDENT COMPETITION 2017-EDITION:
"TELLING A STORY: HOW YOUR COMPUTATIONAL INTELLIGENCE RESEARCH BENEFITS SOCIETY AND HUMANITY"

Web-based Interactive Demo of Robot Navigation using Fuzzy Control

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1 PROJECT INFORMATION

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- Start and End Date: **October 26th – November 11th, 2017**
- Type of Artefact: **Interactive Tutorial / Demo**

2 BRIEF SUMMARY

Computational Intelligence (CI) is the study of adaptive mechanisms to enable or facilitate intelligence behavior in complex and changing environments [1]. CI, a sub-branch of Artificial Intelligence (AI), already has a wide-ranging impact on our lives in these days. Fuzzy Systems is one of the five main paradigms of CI which is interesting one. It have been used and applied to control systems, fault diagnosis, clustering and pattern recognition [1, 5].

In this project a web-based interactive demo which focuses on simulating how a real-life application of fuzzy sets theory is introduced. Fuzzy control can be implemented and used to be solutions

in solving real-world problems. The robot navigation was chosen as an example to simulate how human beings can apply fuzzy sets theory in this scenario. With self-control of the robot, we can easily specify a destination for it. The robot manipulates itself by walking to the waypoint we input. Thus, we will see that CI algorithms will have computational adaptivity and fault tolerance [1].

A specific task of the robot is achieving its input destination. However, it needs to face a number of various situations which have a different environment conditions. In order to deal with these, it should have multiple concurrent processes from all available sensor data. In this work, the end-to-end processes have been designed from scratch. Fuzzy rules and membership functions from [3] are mainly used for the navigation part. After applying fuzzy rules, the actual output for the robot is the velocity and adjusted angle of it is then calculated with the idea from [2] and fine-tuned.

Web-based interactive demo of robot navigation using fuzzy control was created with web-based technology. To the point, it can be used to open up education around the world from anywhere, anytime and any device. This project is implemented internally in mainly HTML and JavaScript, with helps from JavaScript libraries — *jQuery*, *Matter.js* and *plotly.js*.

REFERENCES

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