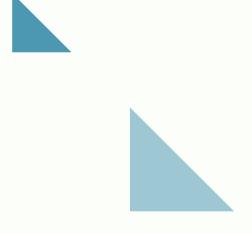April 2021

Project Proposal

Microprocessors II Course

Presented to Dr. Khaled Mohamed

Motivation

There is a myriad of places, on earth, let alone in the universe that are quite extreme to endorse the presence of humans, many of such places may be of interest in terms of resources, exploration or even exterrestial life. On contra, many of the other places that welcomed the ubiety of humans for decades were later subject to environmental events or natural disasters that made it no longer the case. For centuries, humans have learnt to just stay away of such places to avoid all chances of threat, but now, it's the twenty-first century and we... still prefer to stay away per se, but in a different way, that allows seeing, interacting and learning about what's happening in such places even **without being there** and just because it matters for us. This is what we plan to see through in this project.

Idea & Concept

Our sketch for the project is pencilled as a microprocessor controlled system that tallies with a **Mars Rover**, but on earth, the rover should be able to go to places in which humans shouldn't be, it should be able to avoid obstacles, wheel through uneven ground, gather information about present resources and draw samples if needed, all while passing live feedback to a monitoring system relating to what it senses in the surroundings, and how they look. Because in one dimension it's a discovery robot, it should be able to interpolate a topological view for the location it's in just by scanning through the surroundings and gathering the required data. The rover is hence a product of bringing microprocossers, embedded systems, robotics and artificial intelligence all together.

Functionalities

The CMP Rover features 7 main functionalities that reflect upon its main objective, these are:

1 **Sensing the environment**

This includes and isn't restricted to temperature, humidity, pressure and the presence of dangerous gases.

2 **Carrying Objects**

The rover should be supported with a robotic arm that can help draw samples or carry objects from the surroundings.

3 **Overcoming Obstacles**

The rover's mechanism of motion should be able to avoid obstacles and maneuver through uneven land.

4 **Streaming Surroundings**

The rover should be able to share what it sees happening around it to us (its owners) over the network.

5 **Monitoring System**

This should be achieved through a cross-platform application that acts as an interface between humans and the rover, through this interface they should be able to monitor it's status (sensory and imagery data) and give it different orders (e.g. to relocate somewhere, or draw a sample).

6 **Object Detection**

The rover should be able to detect special objects in it's surroundings and take necessary action based on that (e.g. approaching a human if it notices any to see if they are in danger or need anything)

Functionalities

7 ***Creating a Map of The Surrounding Environemnt***

As the rover manuevers around, it interpolates a topological view of how the surroundings look like, such topological view should be then available at the monitoring system and should help in understanding the topological structure of the area at hand. This feature will be possible due to initial work by our colleagues from Ain Shams University.

Final Thoughts

We may not be limited to the functionalities we have demonstrated so far, many other things are in our heads but sometimes we can never make sure if an idea would be feasible. Besides image recognition we also thought about voice recognition, but can not be certain if that would be suitable given all the possible noise due to the rover. After all, the point here is that some features may be added, or changed as we work and learn from the project.

Although it might seem that the rover is bound to scientific applications (gathering sensory data about the area, samples, ...) we also have considered it as a rescue robot, for example it would investigates the rough, uneven after some natural disaster (seismic event) and gives back information about or try to help those in need.