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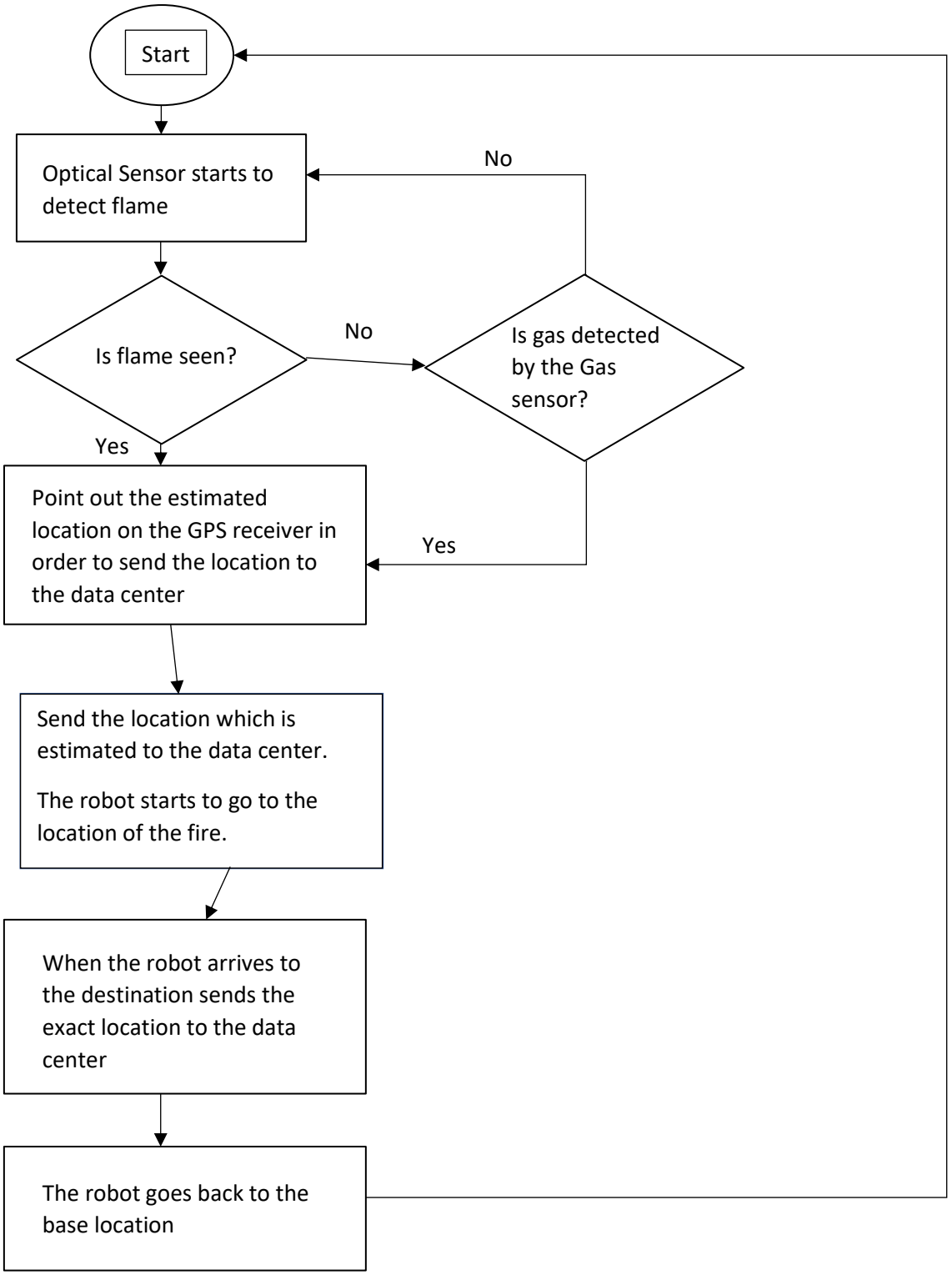
Brief project background:

By increasing fire in the forests and loosing lots of trees and jungles during recent years. By looking at this background we should find a solution to protect our environment.
In this proposal we want to design an unlimited budget robot which can go around a 1km x 1km area and when fire is detected in this area it will report the fire location to the data center.

Technology and market analysis:

By creating this robot, we can prevent lots of loss in trees and areas and also preventing air pollution. So, we can have this view that this technology can help governments and municipalities to have lower costs in facing with global warming and loosing forests.
This robot has the technology to find the base location of where the fire is happened. Also, it has a technology which help the robot to have a movement and the most important part is that it can detect the type of gas which is releasing into the air. As well, it can observe the flame into its area and go through that way to find its exact location.

System high level Design and Architecture:



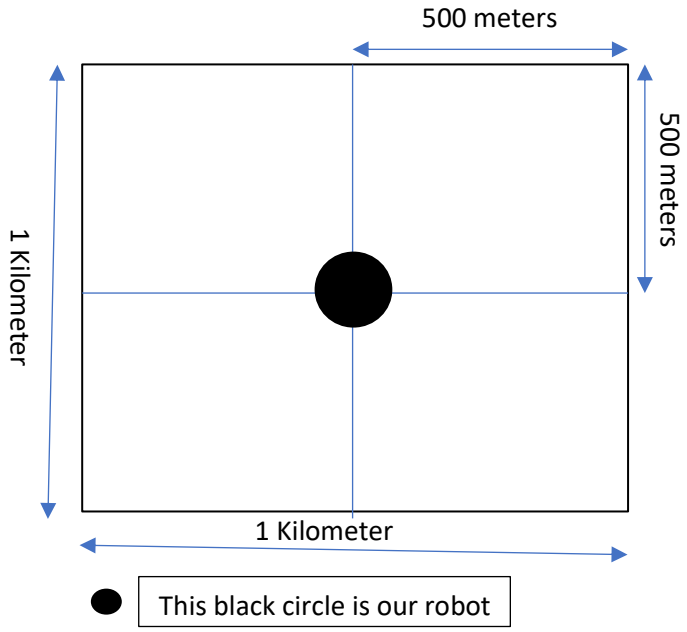
Function description of modules and parts:

This robot has a module that can scenes smoke, flame, any kind of gas, and the temperature as the fire might cause a high temperature around its area.

The first thing that should be checked is flame which can be seen by “Optical sensor”. It is the obvious thing that shows the fire is happening.

After the flame is seen by the optical sensor, the sensor will locate the flame on the map by pointing out the location of the flame using “GPS receiver”. This GPS receiver has the map of this 1KM x 1KM area and when the visual data are sent to this GPS receiver it just sets an estimated area on the map. Then it sends the data which is collected to the data center and until the fire fighters reach there the GPS receiver create a direction to go to the exact location where fire is placed this direction is navigated by “DC Motors”. The DC Motor has wheels to move our robot but it needs a source of actuator to moves our DC Motor. Thus, we use a “Linear actuator” to actuate this motor in order to move to the fire. By all these procedures it reaches the exact location where the fire is placed and sends the exact location to the data center.

After above scenario our robot goes back to the center of our area as we defined it as bellow:



The reason that we use this pattern for our robot, which is the robot stays in the center of our area, is that this location is near to all the locations and whenever something happen it can easily detect and has the least distance to the destination.

The next opportunity that our robot has is that, it has an IOT “Gas Sensor” which helps it to detect which kind of gas is released into the air and also this sensor has this opportunity to find out the gas type from a 500 meter distance so by standing in the center of our area it can detect if any kind of gas, which is an evidence of a fire, is in the air again it starts to go to the base of that gas by sending the gas sensor data to the GPS receiver and placing the location on the map then reports that location to the data center and goes to the location by the motors and sends exact location to the data center and goes back to its canter.

This robot is very simple but can solve our problem in finding a fire through a 1 Kilometer area.

The technology which is needed in this robot is a high-speed internet connection and also it needs a database that saves every evidence which it sees and save them in its database to have a record of dangerous and more predictable area that might fire happen there.

Testing plan

We assume that we have a 1KM x 1KM and we put our robot in its starting point which is the center of our area.

Then we go to one of the corners and we assume that place as the most far location that our robot should detect a fire. In that corner we start to set a fire to test how it works. Obviously, our robot has a camera which captures the flame when it detects them. In this situation our robot should capture those pictures and save them and by saving them in its database we will find out its optical sensor works properly.

Then it sends data to the GPS sensor and the GPS sensor starts to direct our robot if it goes correctly to the destination, it will show that our GPS works properly. Also, this estimated location should be sent to the data center and in this scenario test center can be our mobile phone number.

After it reached to the destination, as our robot is fire proof, it sends the exact destination to our mobile phone number again.

Another scenario is that we use a source of CO2 gas and release it to the area without any flame. In this situation the gas sensor should work by storing received data and the area that it senses approximately will locate on the GPS and again the GPS should send the data to the data center (personal phone number). Also, it starts to go through the source of the gas until it reaches the heaviest amount of the gas in this situation again sends the exact location of the gas to the data center.

After each of these processes the robot should go back to its center and stays there till the next evidence of fire comes out.

Summery:

Our robot can work as a fire detector in the center of a 1Km x 1Km area. It can senses gas (which are flammable gases) and also can see the flame of a fire from 1kilometer far.
It can help governments and environment in order to prevent any injury happen to the homes and trees.

References:

An Intelligent Fire Warning Application Using IoT and an Adaptive Neuro-Fuzzy Inference System, by ***Barera Sarwar, Imran Sarwar Bajwa, Noreen Jamil, Shabana Ramzan, Nadeem Sarwar***

Monitoring System for Early Detection of Fire in Wetlands based Internet of Things (IoT) using Fuzzy Methods
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