



Image Processing-Based Automatic Mobile Fire Extinguisher Robot

Term Project

Course: ME331

Instructor: Assoc. Prof. Sinan Öncü

The Aim & Problem Definition:

- Aim: creating a fire extinguisher vehicle, which can automatically detect fire, get closer to it and act according to the commands that are coming from the user
- Problem definition : misdetected or mistreated fires causing deforestation
- Image processing system : fire detector
- Flame sensor : position assigner

Market Analysis:

- Main focus: undetected or lately detected fires → causes deforestation
- Our project: minimizes human factor & automitizes the extinguish process

DESIGN AND IMPLEMENTATION PROCEDURE

Steps:

- Literature Survey
- Finding Necessary Equipments
- Writing Image Processing Code & Applied on Picture Data
- Constructing Prototype 1 & Preparing an Explanatory Video
- Preparing Fritzing Schematic
- Understanding the Mistakes Made for the First Prototype & Problem Solving
- Improvements & Iterations on Prototype 1
- Constructing Prototype 2 & Preparing an Explanatory Video
- Preparing Fritzing Schematic & Block Diagram
- Final Editings on Code
- Report Writing & Presentation Preparation

ACHIEVEMENTS



Fire Detection via
Image Processing



Extinguishing Fire
Using Water



Translational Motion
Towards Fire

Application Procedure:

- In order to identify flame we used image processing, we train our cascade classifier model by using Cascade Trainer GUI program.
- Initially we created 2 files; one of them consists negative images which contains no fire, and the other file consists only fire pictures. After creating file and adding pictures, program creates a xml file which is used in python code.
- While creating our classifier we used 340 negative photos (random photos which contain no fire even partially) and 162 positive fire photos.

However, pictures that we downloaded from internet and uploaded the program cause several problems.

PROBLEM IDENTIFICATION

Problems Encountered During Design and Implementation:

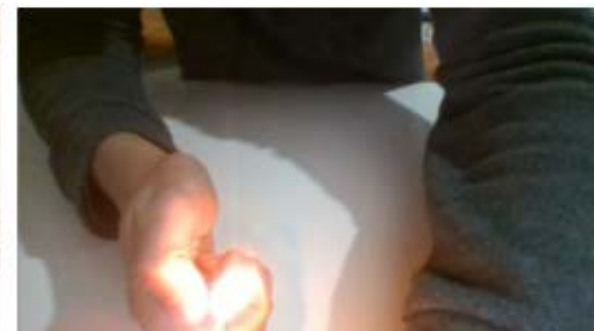
- Misidentification of different objects as fire due to shape similarity
- Misidentification of different objects as fire due to reflection occurring in camera lens
- Incapable of identifying fire from top view



Problem 1

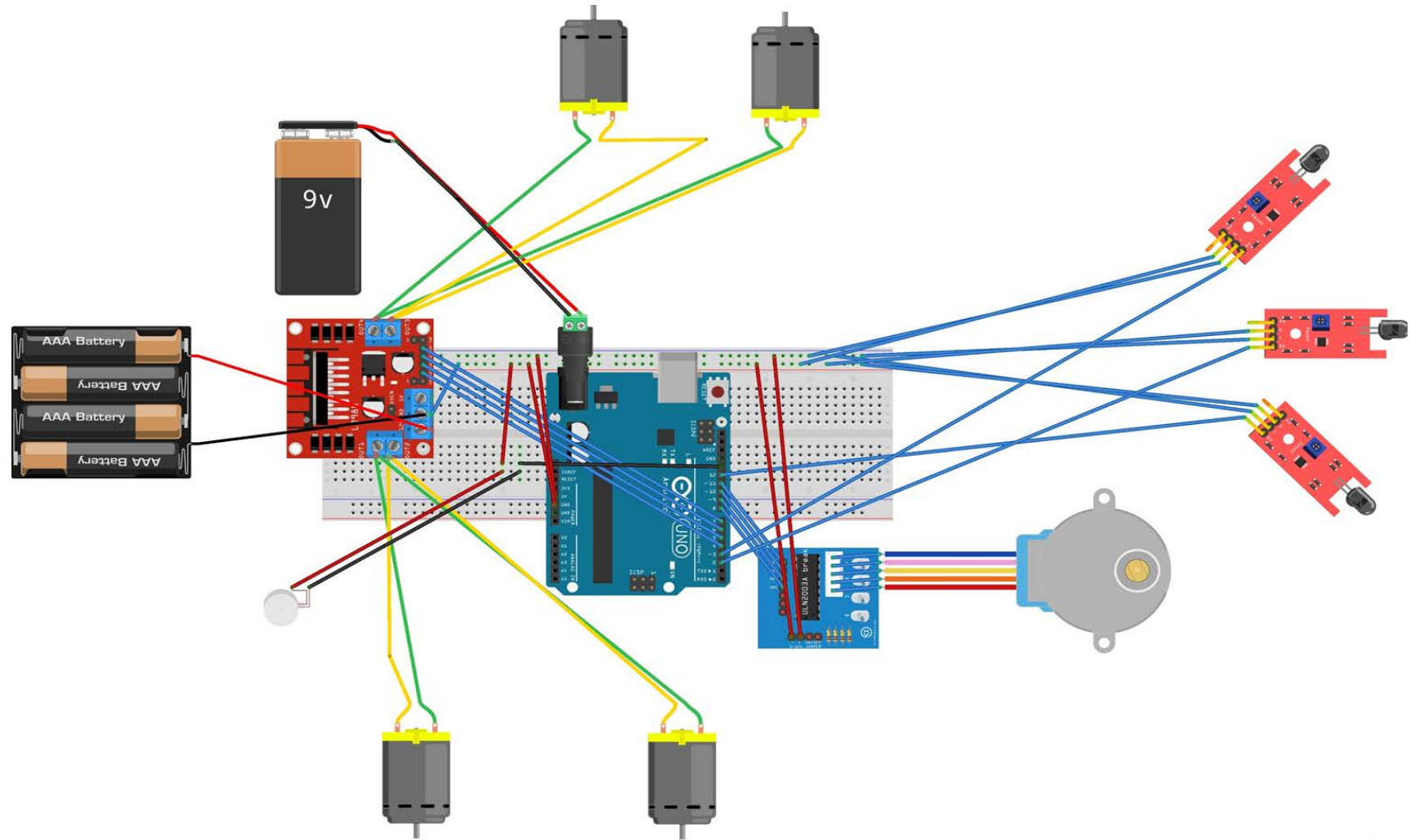


Problem 2

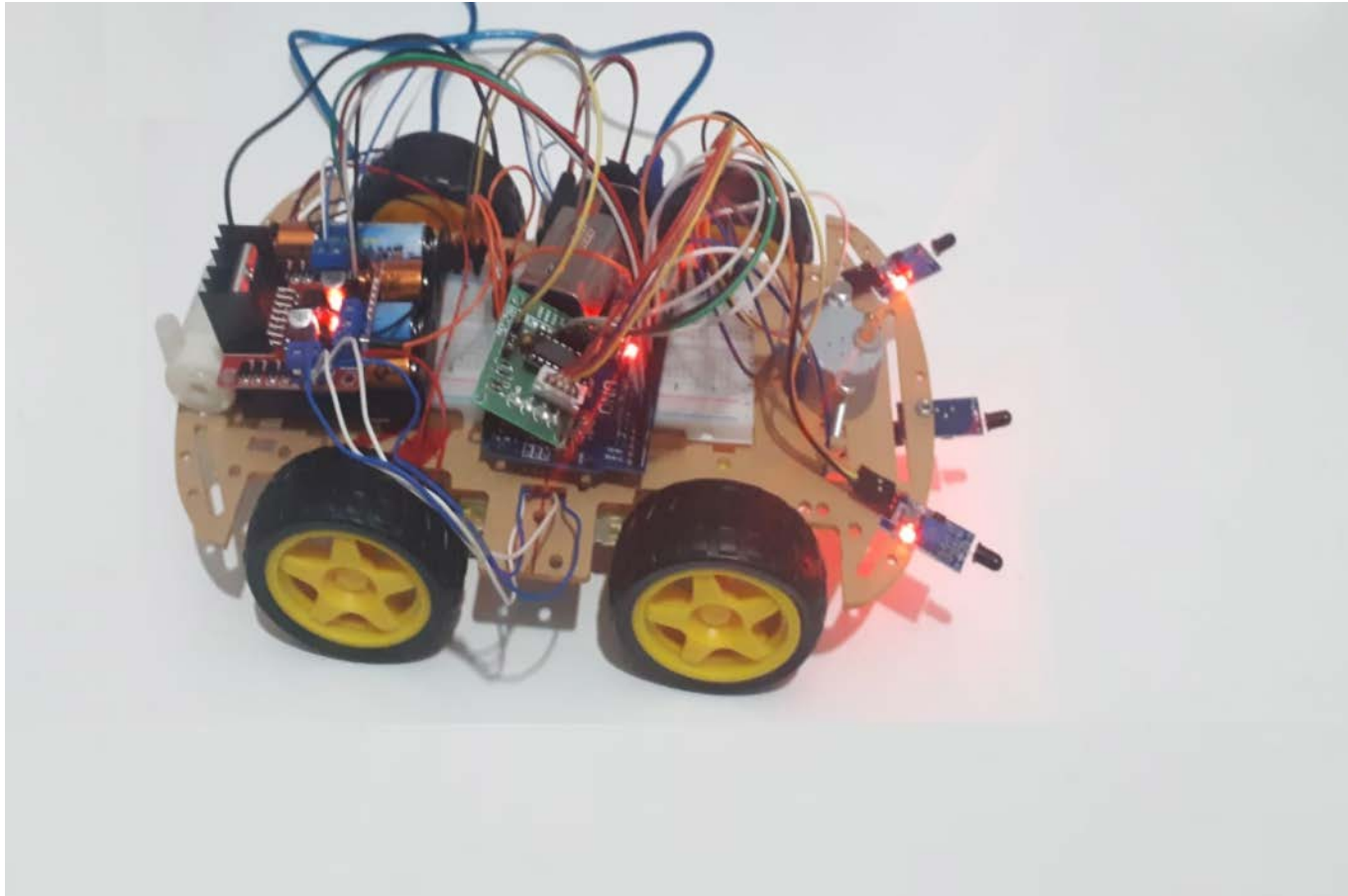


Problem 3

SCHEMATIC OF PROTOTYPE 1



TEST VIDEO OF PROTOTYPE 1

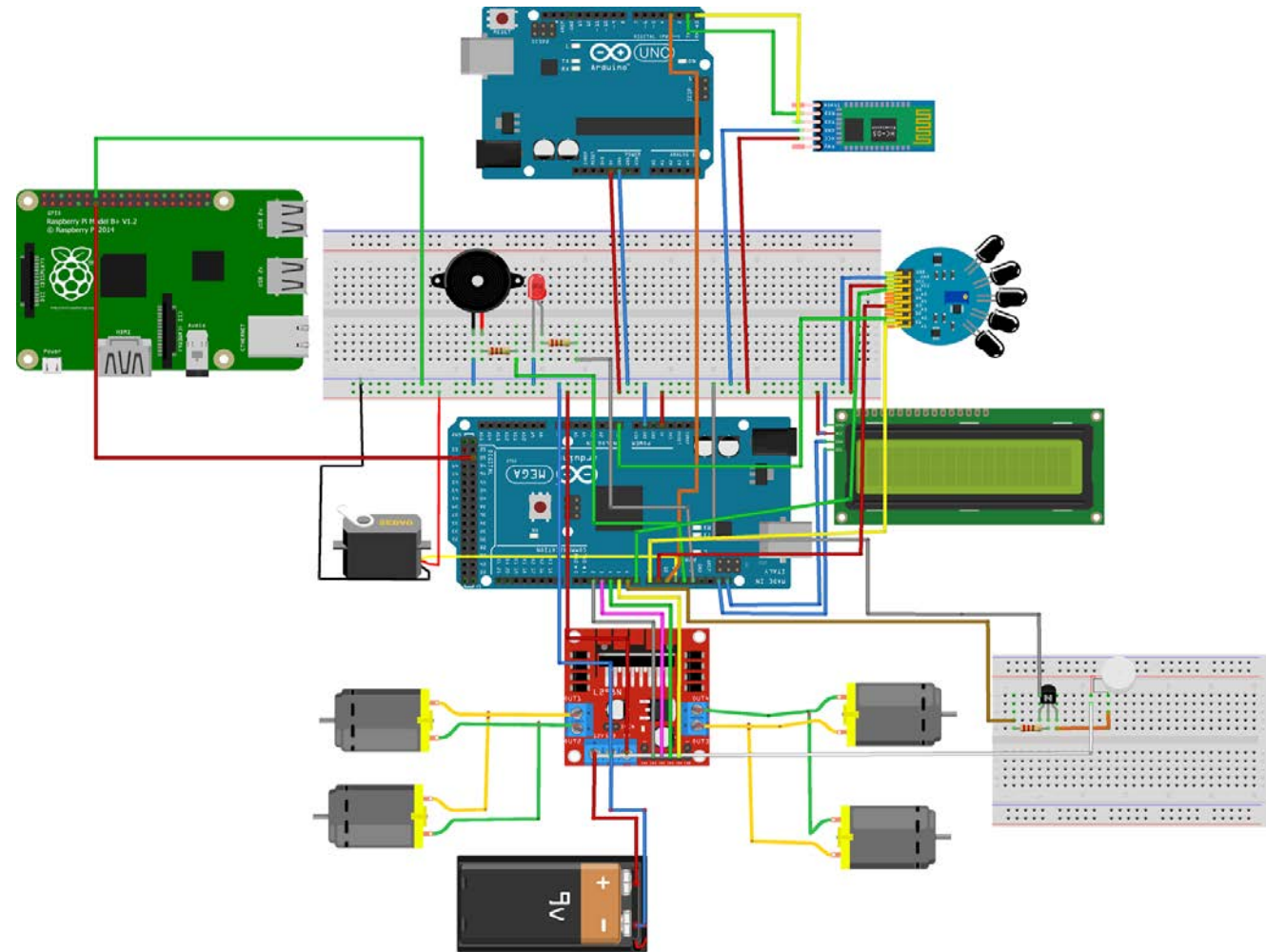


PROBLEM SOLUTION

Improvement on Prototype 2:

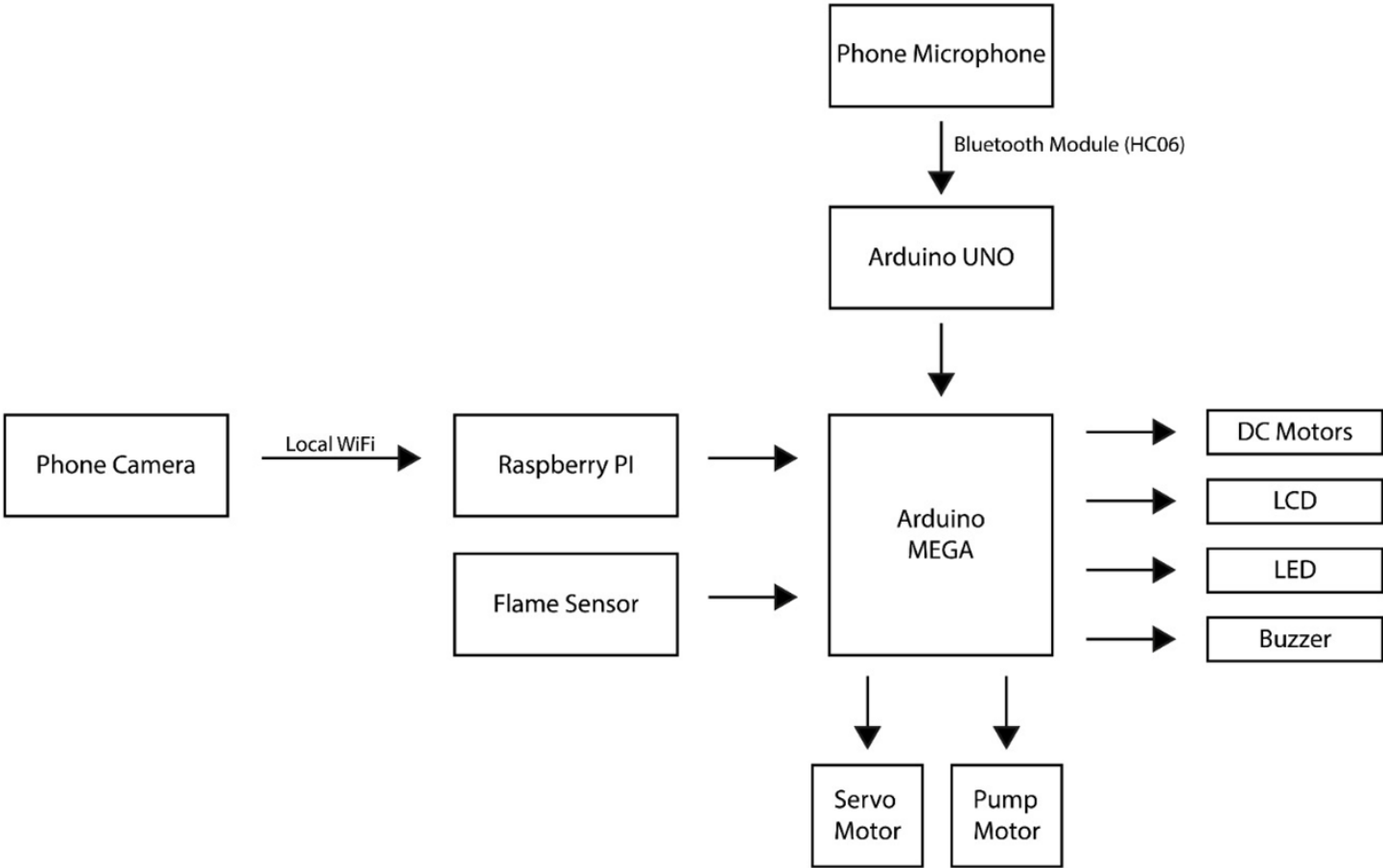
- Arduino Uno → Arduino Mega
- Change of Chassis → Cleaner Look / Sufficient Space
- New DC Motors → Able to Carry Increased Load / More Agile
- 3 Single Headed Flame Sensor → 1 Five Channel Sensor

SCHEMATIC OF PROTOTYPE 2



fritzing

BLOCK DIAGRAM OF PROTOTYPE 2



TEST VIDEO OF PROTOTYPE 2



RESULTS AND CONCLUSION

- In a nutshell: with the second prototype, we were able to implement wireless voice command, wireless image processing, position control, LCD display and warnings in addition to a cleaner look, better maneuverability in comparison with our first prototype.
- At the end of our project, we made a fire extinguisher vehicle, which can automatically detect fire, get closer to it, and act according to the commands coming from the user by applying image processing system as our fire detector and position assigner
- Since image processing unit has crucial advantages over fire detecting with sensors, such as opportunity of usage in the daylight, when it comes to navigate the vehicle, the process of compiling and processing information coming from the camera unit is very complex and time consuming as it requires a lot of processing capacity.





**THANK YOU FOR
YOUR ATTENTION!**

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