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International Space Object Orbit Tracker

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ABSTRACT

This software engineering project involves development of machine learning algorithms for embedded applications. High speed 32-bit hardware devices such as Raspberry Pi and ARM microcontrollers has become inexpensive and readily available. Machine learning algorithms for applications such as image processing and image recognition are computationally intensive. But with the availability of low cost 32-bit embedded computing devices, it is now feasible to implement then on embedded hardware. This project will explore embedded applications of machine learning algorithms by following a software engineering design and test approach.

INTRODUCTION

During the first phase of this research project, the code is compiled using embedded C++ on the Raspberry Pi. Stepper motor is used for azimuth control and a 180 degree servo for elevation control. Raspberry pi receives time and location data and controls the stepper and servo motors in real time to move the tracking pointer to point to the location of an object in space.

HARDWARE

Adafruit motor shield is placed on top of the Raspberry Pi to control the motors. Stepper motor is connected to M1 terminals on the motor shield. Servo motor is connected to the Servo terminals on the motor shield. Power supply is connected to the power terminals on the motor shield. Mechanical structure consists of LEGO Technic bricks and gears. For the next phase of the project, telephoto camera will be attached to the tracking pointer and controlled by Raspberry Pi for long exposure astrophotography.

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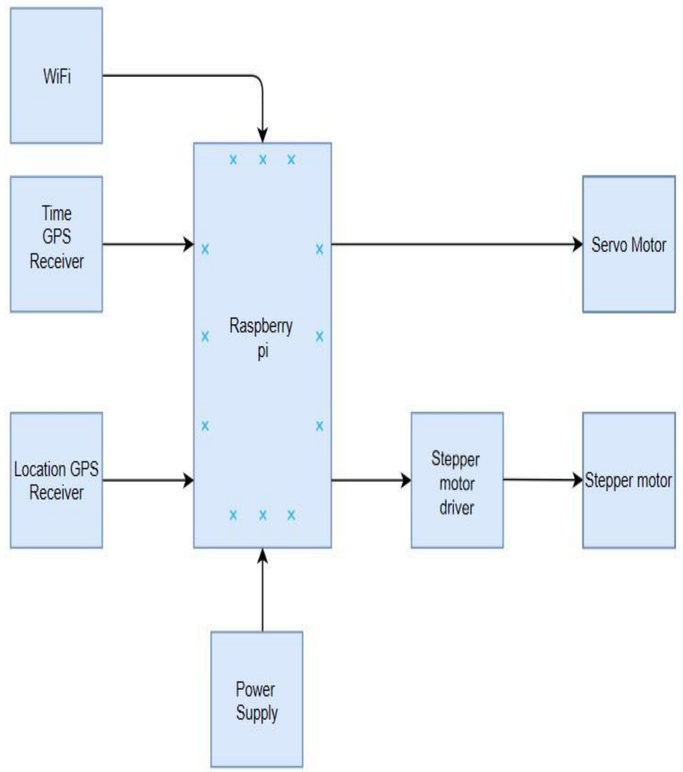
BLOCK DIAGRAM



PARTS LIST

- Raspberry Pi and motor shield
- Stepper motor and mount
- 180 degrees servo motor
- LEGO Technic gears and bricks
- 9V or 12V power supply
- Resistor (5 to 10k ohms)
- Wire and solder

PROGRAM CODE

These parts of the code are used to connect two pins from Raspberry Pi for interfacing the I2C devices.

```
private:
 int _i2caddr;
 I2C i2c;

 uint8_t read8(char addr);
 void write8(char addr, char d);
```

FUTURE WORK

On the next phase of this project, the hardware and software to control a telephoto camera for long exposure astrophotography will be added with the use of Raspberry Pi, along with a real time clock with a battery backup, to keep track of real time movement.

REFERENCES

- Satellite Times Columns: Computers and Satellites, www.celestrak.com/columns/
- Instructables: “International Space Station Tracker/Point”, www.intructables.com/id/international-Space-Station-TrackerPointer/