PIMPRI CHINCHWAD EDUCATION TRUST'S

PIMPRI CHINCHWAD COLLEGE OF ENGINEERING

SECTOR NO. 26, PRADHIKARAN, NIGDI, PUNE- 411044

PROJECT SYNOPSIS

ProjectID: A_16

Image Processing Based Semi-Automated Target Detector and Shooter

Project Group Members:

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ABSTRACT

With ever-growing increase in technology everything is needed with automation. As we know currently India is not having good foreign relations with neighbouring countries like China and Pakistan. These countries continuously trying to provoke war against us wherein we are losing our soldiers. Therefore, to reduce human casualties and to improve defensive systems at borderline we must upgrade our systems. Keeping this in mind this system is designed which emphasizes on fabrication of automated target detector and shooter robot.

The primary objective of this system is to serve a wireless automated machine which is better aesthetically. The system will be based on raspberry pi processor with pi camera and computer vision for its basic purpose and will be trained for specific object or event detection in real time video and will send the signal back to controller so that necessary actions will be taken. The processor is chosen in such a way that it will handle the power requirement and processing capacity of all the necessary requirements. The greatest motivation behind this project is changing technology and greatest inspiration is boston dynamics. This system with some advancement can be used for projectile target detection in hilly areas. By the end of the project one can use this system with very ease remotely from certain radio distance to control it and find a specified target with the help of system.

Introduction

1.1 Background

The kind of robots used widely are in industries, companies and in gaming appliances. But there are very few robots working on defence. Out there on borders all that needed is continuous lookout of any unusual movements happening nearby where very less robots are happen to be effective. But what if those robots are given vision and monitoring can be done more feasibly? This system is developed such that it can see the movements happening around and wirelessly from remote location and can work efficiently without any human casualties. We know that in near future all that human work is going to be replaced by the AI powered machineries. Taking this into consideration we came up with this idea of making computer vision-based robot which works automatically for detection of specificevent and take actions accordingly.

1.2 Problem Statement

To design an integrated Computer Vision based system which captures real time video input and processes it to detect specific object, decides it as safe or threat and shoots at object if threat.

1.3 Motivation / Need of project

India is a developing country. We as a country are always trying to push our limits by technological advancements. For sustaining in this era India has to bring developments in the technology as well as its self-defence capabilities. Self-defence is the important priority of our nation in 21st century. As we know currently India is not having good foreign relations with neighbouring countries like China and Pakistan. These countries continuously trying to provoke war against us wherein we are losing our soldiers. Therefore, to reduce human casualties and to improve defensive systems at borderline we must upgrade our systems.

The main motive of this project is to create a system which can replace humans at battlefields, which can be used remotely and which can help our nation to defend itself from threats of neighbouring countries. Which is why we are designing a system which will be a prototype of real machine that can be deployed on borders to increase our defence capabilities and to reduce the casualties on the borders.

1.4 Objective and Scope of the Project

Objectives of Project are as follows:

- Proposed system should be able to detect particular specified object/target by the help of video processing algorithm.
- After detection of object/target system controller should be able to shoot at that particular object.
- The shooting mechanism is pneumatic based subsystem which helps the controller gain maximum accuracy for hitting the target.
- Proposed system consists of wireless communication which provide a long-range contactless operability to user.
- System can replace Humans on the battlefield and therefore helps in reducing the human casualties on borders.

LITERATURE SURVEY

2.1 Literature Survey

Sr. No.	Title of the paper	Year of publication	Publisher	Methodology	Conclusion
1	Digital image processing techniques – a survey	May - 2016	S. Muthuselvi and p. Prabhu	Image pre-processing, image compression, edge detection and segmentation.	Digital image processing deals with manipulation of digital images through a digital computer. In this paper various types of DIP technique presented in the literature are discussed and analyzed. The DIP technique using image compression, edge detection and segmentation provides better compression ratio and accuracy of an image.
2	Literature survey on the various methods of object detection in video surveillance systems	Dec -2016	Mrs poonamkhare	Surveyof various phases of VSS is made and for each phase various alternative solutions.	In this paper, we have presented various studies , methods through which a better and clean picture of video surveillance can be projected. It is clearly stated that if all the steps of video analytics is taken and problem solving methods with its pros and cons are applied, an effective mechanism can be build up which will result in fruitful and clear image capturing.
3	Object detection with deep learning: a review	Apr - 2019	Zhong-qiuzhao, pengzheng, shou-taoxu, and xindongwu	Deep learning based object detection frameworks.	Due to its powerful learning ability and advantages in dealing with occlusion, scale transformation and background switches, deep learning based object detection has been a research hotspot in recent years.

4	Analytical description of pneumatic system	Sept - 2013	Karan dutt	Pneumatic's working and components.	We studied about various types of Pneumatic actuators and its working.
5	Real-time object detection and tracking in an unknown environment	Aug – 2011	Shashank prasad, shubhrasinha	Image and Video Processing.	The proposed algorithm for object detection and tracking in unknown environment shall open new vista in field of computer vision for developing real world applications and also improvising currently existing algorithms to be operational in the real world.

Summary of Literature Survey :
This papers gave us the basic idea of how Object Detection can be done and how to implement it in real life problem statement. Also we came to know how Image processing is done in the outside real world, how to track objects. This papers also helped us for selection of Pneumatic Actuators, Compressors, etc.

3. METHODOLOGY

3.1 Block diagram:

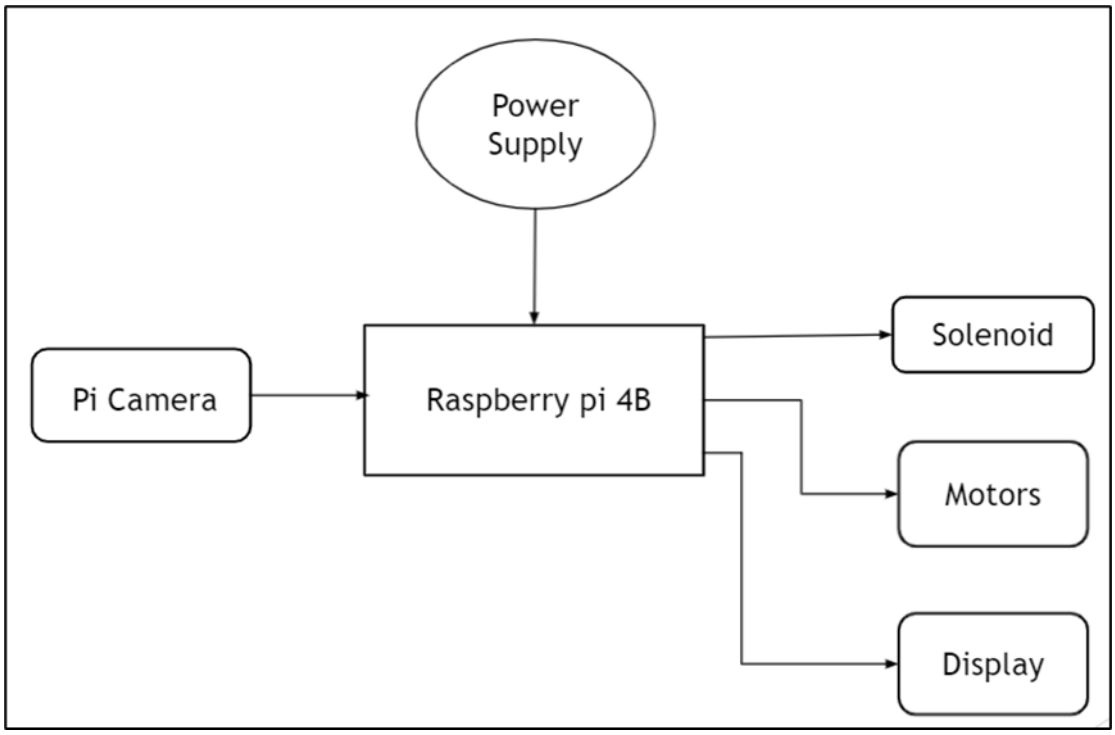

Fig 3.2.6: Block Diagram of System

3.2 Hardware specifications / requirements

3.2.1 Raspberry Pi 3 Model B+:

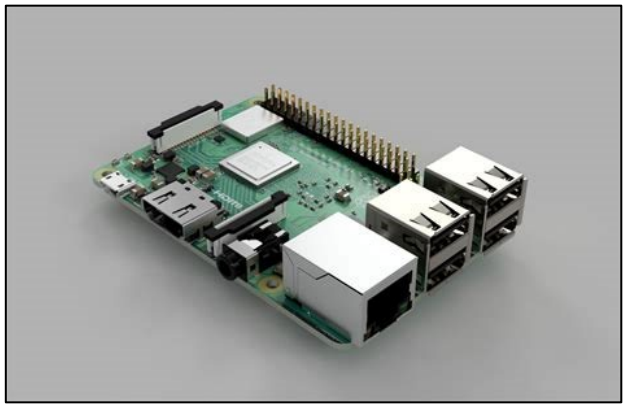

Fig 3.2.1: Raspberry Pi 3 Model B+

The Raspberry Pi 3 Model B+ is the latest product in the Raspberry Pi 3 range, boasting a 64-bit quad core processor running at 1.4 GHz, dual-band 2.4 GHz and 5 GHz wireless LAN, Bluetooth 4.2/BLE, faster Ethernet. It has Quad Core 1.2GHz Broadcom BCM2837 64bit CPU with 1GB RAM. Has BCM43438 wireless LAN and Bluetooth Low Energy (BLE) on board. It has a 40-pin extended GPIO with 4 USB and 2 ports. Has CSI camera port for connecting Raspberry Pi camera. Micro SD port for

loading your operating system and storing data. It has been given upgraded switched Micro USB power source up to 2.5A with is beneficial. Raspberry Pi here is used for interfacing all the required sensors and make the robot work. It works as a main controller for the project.

3.2.2 Pi camera:

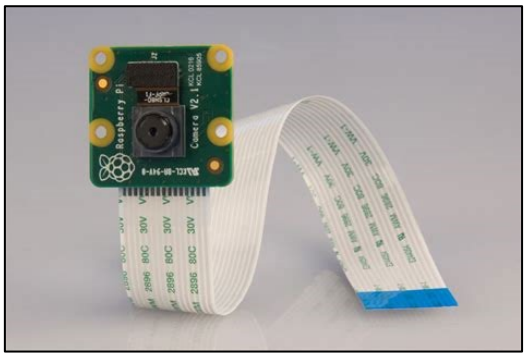

Fig 3.2.2: Pi Camera

The target is detected using the camera and image processing algorithms. For this purpose 5MP Pi camera is needed. Raspberry Pi comes with additional port for connecting the Pi camera which is very easy to interface.

3.2.3 ADC0804 IC:

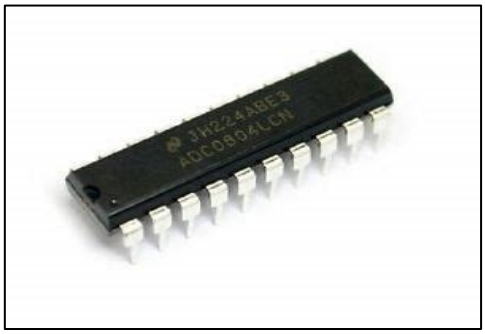

Fig 3.2.3: ADC0804 IC

The analog sensors when interfaced with Raspberry Pi needs the analog to digital conversion as Raspberry Pi has all digital ports. For this purpose ADC is required. ADC0804 is an 8 bit ADC IC (integrated circuit) which converts the input analog voltage to its equivalent digital output.

3.2.4 Motor and Motor driver IC:

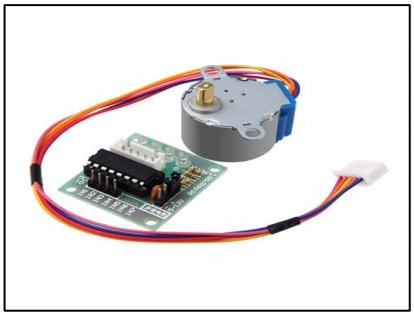

Fig 3.2.4: Motor and Motor driver IC

4-5 motors with motor driver modules are used for controlling the mechanisms used to align, pull, hold and release in the robot. The motors are connected to the relays for their activation when required. L298D is used as the motor driver for DC motors used for pulling, aligning mechanisms, while servo motors are used for holding, releasing mechanisms.

3.3 Software specifications / requirements

3.3.1 OpenCV:

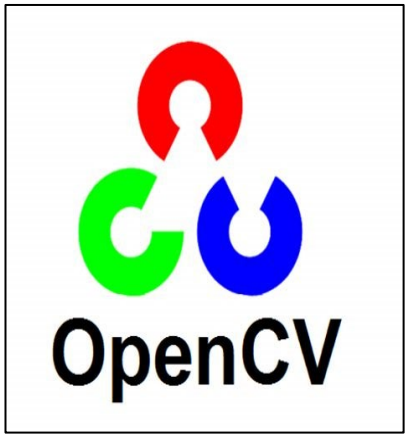

Fig 3.3.1: OpenCV Library

OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. The Open Source Computer Vision Library has more than 2500 algorithms, extensive documentation and sample code for real-time computer vision. Here in this project Opencv is used for real time detection of the archery target. As Opencv is capable of capturing and finding images which the model is trained with we've chose this software.

3.3.2 Visual studio Code:

Visual Studio Code is a free source-code editor made by Microsoft for Windows, Linux and macOS. Visual Studio Code is a streamlined code editor with support for development operations like debugging, task running, and version control. It aims to provide just the tools a developer needs for a quick code-build-debug cycle and leaves more complex workflows to fuller featured IDEs, such as Visual Studio IDE. In this project it is used as the code editor.

3.3.3 Python Programming Language:

Python is a high-level, general-purpose and an extremely popular programming language. Python programming language (latest Python 3) is being used in web development, Machine Learning applications, along with all cutting-edge technology in Software Industry. Python is currently the most widely used multi-purpose, high-level programming language. Python allows programming in Object-Oriented and Procedural paradigms. Python programs generally are smaller than other programming languages. Here we have used python as our main programming language for all the required operations and computations right from detecting the archery target till working of the motors.

3.4 Flow chart

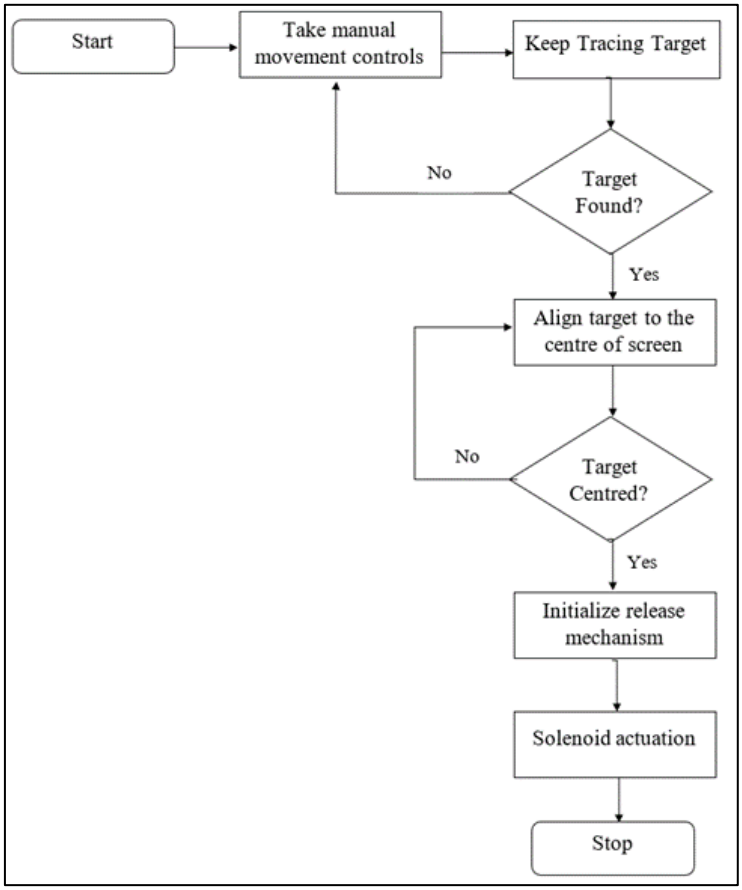

Fig 3.4: Flowchart

The robot starts taking manual control action and starts tracing the target in camera as soon as it turns on. The robot keeps on searching the target until it detects target into the camera screen, As soon as the target is found anywhere in pi camera the robot performs following operations in order.

1.Identify the target

2. Aligning robot such that the target is centred .

3. Give feedback to controller and wait for further instructions.

When controller confirms the target and releases shoot command then the power is applied to the shooter through pneumatic actuator and target is been hit.

4. CONTRIBUTION OF THE PROJECT

Applications of the project need to be specified pertaining to following areas

1. Health & Hygiene
2. Agriculture: Crop, food and water
3. Energy
4. Transportation
5. Quality Education & Effective Governance
6. Communication & Networking (Cyber security etc)
7. Mention the SIG to which this project belongs.

5. EXPECTED CONCLUSION

The project plans to propose a system which would detect specific target objects with the help of video processing algorithm. Once the target object is detected, system controller shoots aiming at the same targeted object. Maximum accuracy is achieved by using pneumatic based subsystem.This proposed system consisting of wireless communication provides long range contactless operability to the users. Hence ,this system in future can replace human- beings and therefore help in reducing human casualties on the border.

6. REFERENCES

Journal /Article /Paper

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