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Autonomous Object Tracking Robot Using Computer Vision

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Abstract
This paper presents a dream based object following robot which is driven by haggles by a PC alongside programming. The goal of this undertaking is to plan a robot which is naturally constrained by PC to follow and follow a shaded item. Accentuation is given on accuracy vision based automated applications. Picture securing by the robot is accomplished by utilizing a PC-based webcam, and afterward it is ship off picture handling programming for additional handling. The general paper depicts a visual sensor framework utilized in the head of mechanical technology for recognizable proof and following of the item.

1. Introduction

In their environment, vision-equipped mobile robots are the most desirable. They are not constrained to a single physical position and can move about freely. For improved navigation, a mobile robot requires appropriate real-world data in real time. In addition, numerous robot vision applications make use of object tracking techniques for applications like autonomous vehicle navigation, surveillance, and many others. Even though there have been a lot of studies and experiments over the past few decades, they have all been focused on finding solutions to the difficult problems of monitoring the desired goal in noisy and chaotic environments.

The research and development of a manual phone application control prototype and an autonomous mobile robot that can vacuum clean a room or even the entire house is not an easy task. Some assumptions and simplifications were made regarding the initial concept of an "ideal" autonomous/manual vacuum cleaner in order to tackle such a task and complete it within the course's six weeks. Due to their inherent complexity or their mechanical implications, some functional requirements that would enhance the robot's performance were not taken into account in this manner. These semi- or fully autonomous robots provide services that benefit both humans and equipment. The following specifications were discovered in order to keep our robot as simple as possible while still achieving the initial objectives, namely an autonomous vacuum cleaner robot that can randomly navigate through a room or a house with the least amount of human assistance.:

- Obstacle avoidance
- Floor detection
- Collision detection
- Fan motor monitoring

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- ❖ Light Sensing
- ❖ Real Time Clock
- ❖ System on automatically
- ❖ These specifications correspond to some of the expected behaviours that will be programmed into the robot. Other behaviours that will increase the overall performance of the robot.

Fig.1 Atmega 16

2. Literature Review

As a vision sensor, the device has a camera attached to a small laptop. A motor driver circuit that uses a PIC chip to communicate with the robot motor connects the laptop to the main controller. The mobile robot has been programmed to follow an object on its path, monitor it, and use a webcam to do so. Once the object is detected, a control system assists the robot in keeping track of it and following it as it moves. The boards are mounted on the robot. The camera takes pictures, which are processed by a small microcontroller that changes the robot's motion and orientation based on where an object is. The robot needs to be able to find and follow an object of interest on its own.

The robot's front is equipped with a web camera. It is intended to be as straightforward as possible because of cost constraints and for the purposes of small robots. Due to the computational complexity and extensive processing required for image processing, a PC mounted on top of the robot served as the primary controller for faster image processing. The algorithms for making decisions are kept on this PC. It gets and processes image data from the camera, tells the microcontroller how to talk to the positioning motors, and lets the robot move. The PC is chosen because it offers a wide range of data processing results that can be seen on the computer screen, making the process of fine-tuning easier. A microcontroller is used to interpret, process, and adjust the robot in response to the camera's incoming signals. To coordinate the robot's motors and drives, the microcontroller serves as an interface that transforms the serial data from the computer system into a motor control signal. Two stepper motors control the motor drivers depicted in the image. Each stepper motor is controlled by a UCN5804B controller that controls the stepper motor's speed and direction. Depending on the desired operation, one can select one of three operating modes. The DIP switch is used to select the appropriate operating mode for stepper motors, which typically use the two-phase mode. The UCN5804B circuit's schematic view can be seen in Figure 7, while its actual

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configuration can be seen in Figure 4. In both figures, two UCN5804B chips were used to independently power each motor. A 12 V power supply (battery) was used for the stepper motors, and a was used to control the circuit 5 V source

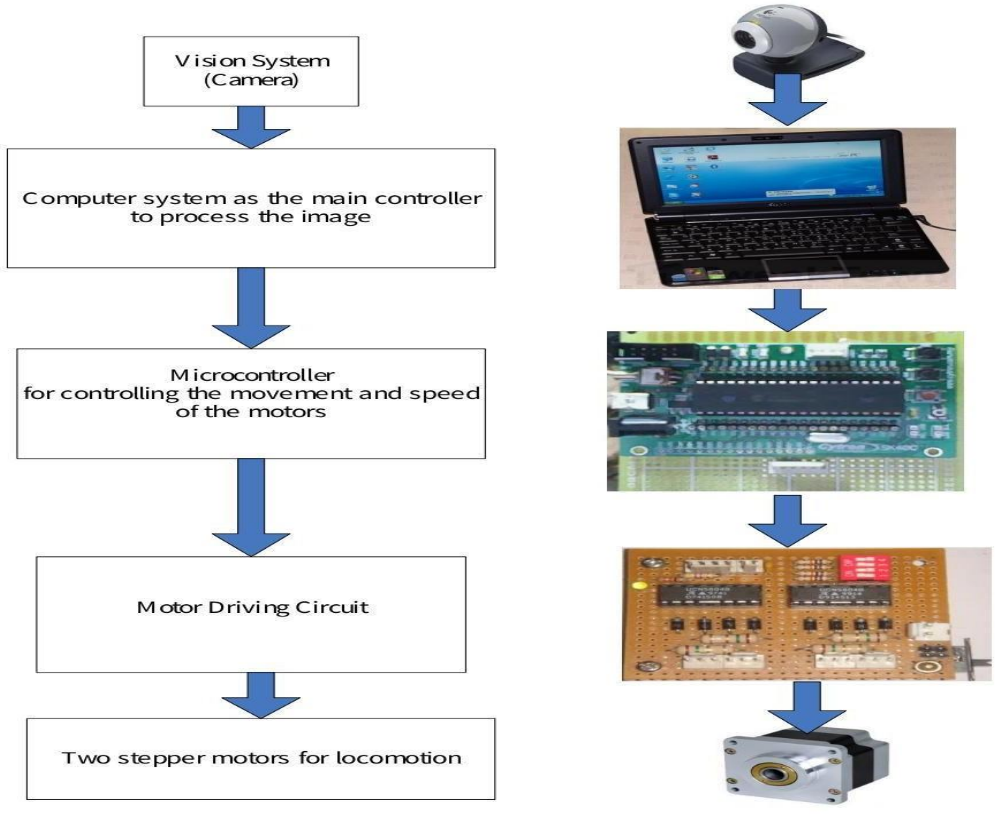

Fig.2 System Hardware Overview

3. Proposed System

An infrared sensor can detect these kinds of radiations, which our eyes cannot see. The detector is merely an IR photodiode that is sensitive to IR light of the same wavelength as the IR LED. The emitter is merely an IR LED (Light Emitting Diode). The light dependant resistor is an electronic component whose resistance decreases with increasing light intensity. When IR light falls on the photodiode, the resistances and output voltages will change in proportion to the magnitude of the received IR light. It is also known as a "photo conductor" or "photo resistor." The semiconductor material used in the light dependent resistor has a high resistance. The bound electrons, also known as Valence electrons, receive the light energy from the incident photos when light strikes such a semiconductor. These electrons become free and enter the conduction band as a result of the additional energy. The pairs of electrons and holes are made. The use of a LDR and an electret microphone as light sensors in an optical spectroscopy system employing pulsed light was the subject of this investigation, with the goal of determining how these charge carriers affect the device's conductivity and resistivity. In place of the proposed photo acoustic chamber, a photoacoustic

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spectroscopy setup was utilized. Two distinct liquids' absorption spectra were examined. The obtained results make it possible to recommend the LDR as the first option for building inexpensive homemade pulsed light spectroscopy systems. This ultrasonic range finder has high performance. It is small and has a remarkable range of measurements, from 2 cm to 4 meters. This ranger is ideal for any robotic application or project that requires precise ranging data. This sensor can be connected directly to your microcontroller's digital I/O lines. Using the straightforward formula below, you can calculate distance in terms of the time it takes for a sound signal to travel. The module operates on a 5VDC input and also provides an output signal directly for the detection of any obstacle up to 4M. Power up the sensor by 5VDC using pins "VCC" and "GND." Distance in cm = (Echo pulse width high time * Sound Velocity (340M/S)/2) The sensor's "Trig" pin needs to first receive a trigger input of 10us. This initiates one cycle of range conversion and causes the transmitter to emit eight sound waves in bursts. The "Echo" pin is set to high level as soon as the signals are sent and stays there until the receiver receives the same sound waves. The Echo pin drops to a low level if the received sound waves match those sent by the same sensor. After 30 milliseconds, the Echo signal automatically switches to low level if no object is found within 5 meters

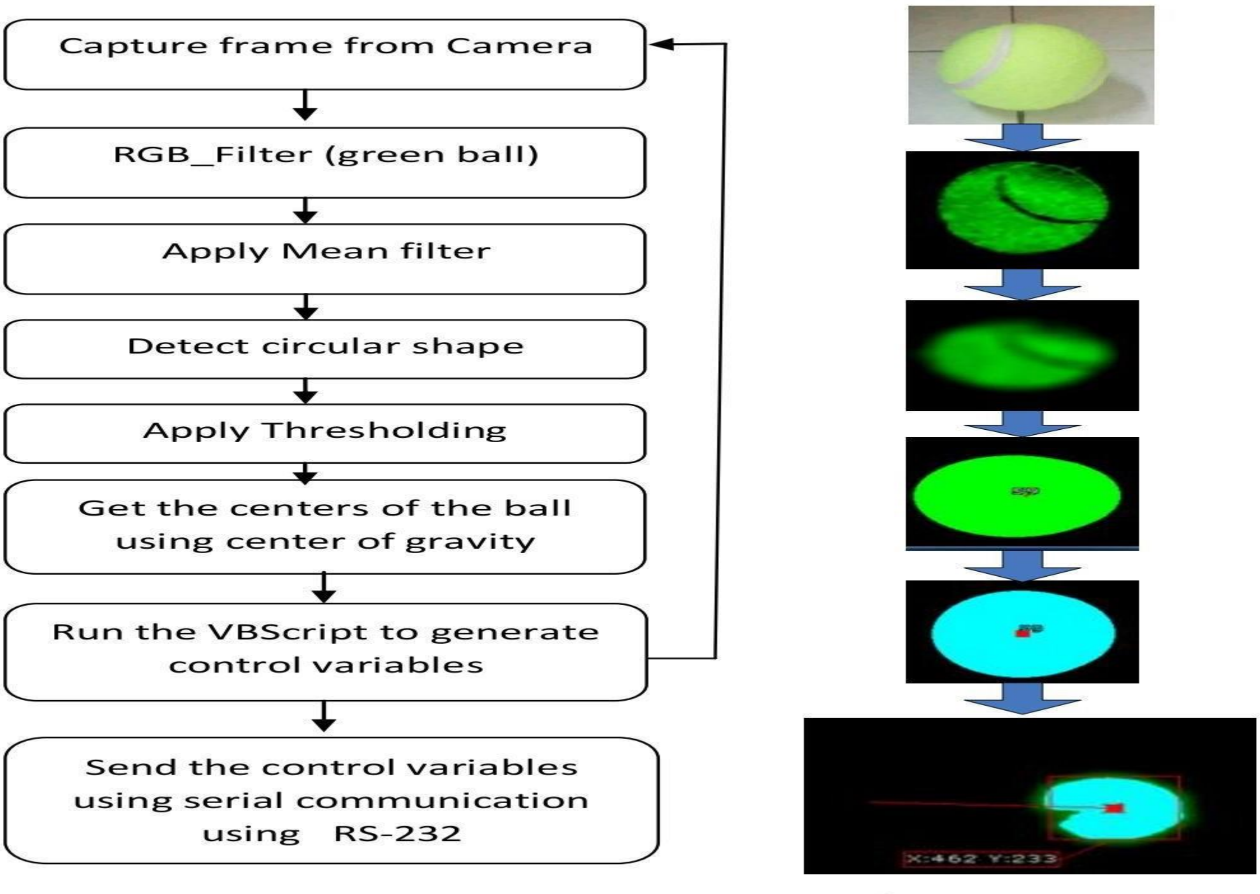

Fig.3 Proposed Method

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4. Conclusion

The vision system object tracking robot was successfully accomplished using only a webcam as the main object detection sensor, demonstrating a great ability to distinguish a tennis ball based on the color and shape, and track the ball as it travels in any direction. The robot has been fitted with the mechanism to search for the ball, and keeps monitoring it if the ball is not present in the view of the camera by spinning in place until the ball is detected. Extensive image processing techniques and algorithms need to be processed on-board using a mini-laptop for rapid processing to accomplish the task. The interpreted information is transmitted to the microcontroller, and converted into real world orientation

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