Line Follower Robot Using A Sophisticated Sensor Approach

Ebiesuwa O. O [1], Adekunle Y. A [2], Akinyemi L. A [3], Oyerinde O. D [4]
[1, 2, 4] *Computer Science Department, Babcock University Ilishan-Remo, Ogun, Nigeria*
[3]*Lagos State University, Ojo, Lagos, Nigeria*

Abstract

This paper proposes a new model for line follower robots built using microcontrollers and this new model has not been in existence before. This new model proposes the adoption of sophisticated color sensors to enable the robot to be able to detect its path in the shortest possible time which is in the order of nanoseconds and is far faster than the time it takes all the other existing line follower robots to detect their path. The new feature provided in this new model is absent in all the other existing models

1. Introduction

The Lie Zi text that was written in ancient China in the 3rd century BC gave an account of an encounter between a King and a mechanical engineer. The mechanical engineer presented the king with a human-shaped figure which had the capability to perform human like tasks to the extent that it was taken for a human being. The king later became curious and demanded to know what this figure really was and the mechanical engineer took the robot to pieces and the king found out that it was only a construction of wood, glue, leather and lacquer variously colored and this made the king greatly surprised.

Early water clocks are sometimes grouped in with the beginning of robotics. They began in China in the 6th century BC and the Greco-Roman world in the 4th century BC where the Clepsydra is known to have been used as a stop-watch for imposing a time limit on clients' visits in Athenian brothels.

Concepts which are close to a robot can be found as far back as the 4th century BC, when Archytas of Tarentum the Greek mathematician postulated a mechanical bird propelled by steam which he called "The Pigeon". Another early automaton was Clepsydra which was made in 250 BC by Ctesibius of Alexandria, a physicist and inventor from Ptolemaic Egypt.

The idea of robots dates back to the medieval period. The people of that dispensation did not have a specific term to describe what we now call robot but they rather referred to them as mechanisms used to carry out human-like activities.

Another vivid account on robotics can be found in "Frankenstein" a story written by Mary Shelly in 1818. In this story Shelly described the robot as a human-like creature that functions as a machine.

The word "robot" is the Czech interpretation or equivalent for worker.

Although the concept of a robot has been around for a very long time, the modern day robot was not born until the 1940's with the advent of computers.

In 1941, Isaac Asimov adopted the concept of robotics which refers to the use and study of robots. During the late 1950's and early 1960's robots became really popular with the expansion of the automotive industries where these robots were employed to help factory workers since robots are capable of carrying out monotonous tasks with precision and accuracy without getting fatigued.

In recent time, the ASIMO (Advanced Step in Innovative Mobility) robot was introduced at the Honda Motor Company in Japan as a substitute for unskilled workers on the assembly line in the Honda factory.

2. Methodology

An example of an existing robot that uses a microcontroller is the line follower robot which is considered in this paper and its principle of operation is discussed below.

The Line Follower Robot:

The line follower robot is a kind of robot that detects and follows a line drawn on the floor. In order to detect the line which is to be followed sensors can be employed. For the line follower robot, when the sensor senses the line the signal is sent to the microcontroller and then the wheels of the robot are controlled and moved through the help of programming.

The basic principle of the line follower robot is to capture the line position by making use of optical sensors mounted at the front end of the robot. To accomplish this successfully an opto coupler which is a

combination of Infrared light emitting diodes and photo transistors is used.

When the sensor senses the path, analog signal is given to the operational amplifier to produce 0s and 1s which are then fed to the microcontroller, the microcontroller then decides the next move according to the program. When the both sensors are indicating low (0) the robot starts to move on the black path, but if the both sensors indicate high (1) then the robot starts to move along the white path.

The microcontroller used is the 8051 microcontroller which is a very popular microcontroller on which many derivative microcontrollers are compatible with and are based on. 8051 microcontroller is based on fully static CMOS (89C52) technology controller with 3-level program memory, 32 input/output lines, 8 interrupt sources, 3 timers/counters, 8K flash memory, and 256 byte on chip RAM.

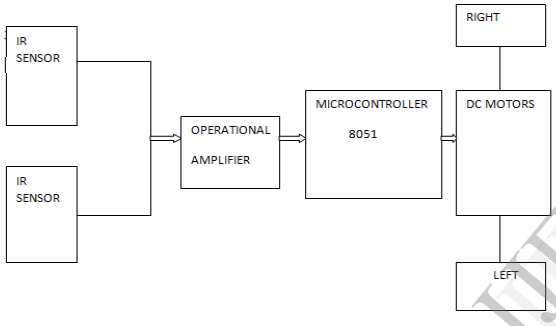

Figure 1: Block Diagram of Line Follower Robot (V Hymavathi and G Vijay Kumar, 2011)

3. Proposed model of the line follower robot

The proposed model of the line follower robot makes use of optical sensors mounted at the front end of the robot to capture the line position. In addition to the optical sensors, sophisticated color sensors are employed in this design such that as the optical sensors capture the line position, the color sensors simultaneously sense the line and then send a signal to the 8051 microcontroller which now controls the wheels of the robot with the aid of programming to move on the path sensed by the color sensor as the right path to follow. The color sensors are highly sophisticated and perform all these operations in a very short time, as a result the time taken for the entire operation is in nanoseconds.

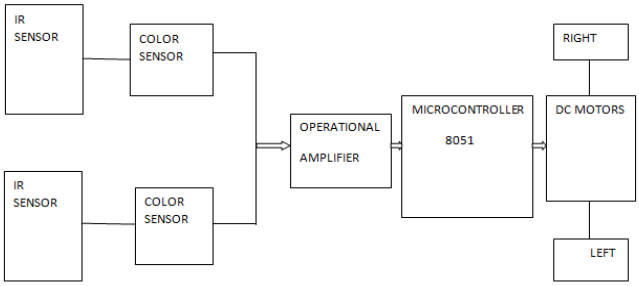

Figure 2: Block Diagram of Proposed Line Follower Robot (Adaptive).

4. Contribution to knowledge

In this paper, a new model for the line follower robot is proposed. This new model is different and better than all other existing models of the line follower robot as it introduces sophisticated color sensors to the design of the line follower robot and as a result of the introduction of the color sensors the robot is able to detect its path in the shortest possible time which is in the order of nanoseconds and is far faster than the time it takes all the other existing line follower robots to detect their path. Hence, the proposed line follower robot will operate faster and consequently do more tasks than all the other existing ones.

5. Conclusion

All existing models of the line follower robot have had the limitation of speed in detecting their path and executing tasks due to their design.

In this paper, the problem of the speed with which the line follower robot detects its path has been addressed with the introduction of sophisticated color sensors which enable the line follower robot detect its path in the shortest possible time after the order of nanoseconds and this speed outpaces that of all the other existing line follower robots.

6. Suggestion for further research

In this paper, the proposed model of the line follower robot addressed the problem of the speed with which the line follower robot detects its path and executes tasks. For further research, another model can be proposed which will further improve on the speed which the new line follower robot offers thereby reducing the time it will take such robot to detect its path and execute tasks.

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