International Journal of Information & Computation Technology.
ISSN 0974-2239 Volume 4, Number 6 (2014), pp. 629-632

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Use of Logic Gates to Make Edge Avoider Robot

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ABSTRACT

Robotics is a currently growing field with various studies going all over the world. Robots are of various types ranging from remote controlled robots to gesture control robots, from wireless robots to humanoid robot. A part of robotics is the study of autonomous robots which are mainly made by the use of microcontrollers to control them automatically and instantly. Edge avoider robot is an example of semi-autonomous robot which when placed on a desk doesn't fall from it. This paper focuses on the use of logic gates to make edge avoider robot thus reducing its manufacturing cost and increasing speed.

Keywords-logic gates, edge avoider, robot, semi-autonomous

1.INTRODUCTION

Autonomous robots are robots that can perform with a high degree of autonomy, which is particularly desirable in fields such as space exploration, cleaning floors, mowing lawns, and waste water treatment. A semiautonomous robot is controlled by its programming and is restricted to what its programming tells it. It can not learn further than a certain point. Edge avoider is a robot which never falls of a edge of a table. It has protruding sensors which can detect beforehand, what lies ahead, whether it is surface or an end. The distance between the sensors is also maintained greater that the width of the robot considering the turning radius of the wheels. When the surface is detected the IR module give a high pulse to the controller and when the edge is detected the IR module does not reflect light thus giving a low pulse to the controller. This results in a mechanism which turns the robot into the appropriate direction whenever the limit of the table ends thus never falling from it.

2.METHODOLOGY USED

2.1 LOGIC GATES

A logic gate is an idealized or physical device implementing a Boolean function, that is, it performs a logical operation on one or more logical inputs, and produces a single

logical output.

2.1.1AND GATE

The AND gate is a basic digital logic gate that implements logical conjunction-it behaves according to the truth table below. A HIGH output (1) results only if both the inputs to the AND gate are HIGH (1). If neither or only one input to the AND gate is HIGH, a LOW output result.

2.1.2 NOT GATE

In digital logic, an inverter or NOT gate is a logic gate which implements logical negation. The truth table is shown below

2.2 SENSORS

Infrared sensor transmit infrared waves which when reflects is collected by a photodiode which gives out HIGH output (logic 1). When photodiode doesn't receive any signal it gives out LOW output (logic 0).

Table 1. *Motor control using sensor output*

Sensor output A	Sensor output B	Motor1	Motor2
0	0	Rotate anticlockwise	Rotate anticlockwise
0	1	Rotate clockwise	stop
1	0	stop	Rotate clockwise
1	1	Rotate clockwise	Rotate clockwise

2.3 FUZZY LOGIC

Fuzzy logic is a form of many-valued logic; it deals with reasoning that is approximate rather than fixed and exact. Compared to traditional binary sets, fuzzy logic variables may have a truth value that ranges in degree between 0 and 1. Fuzzy logic has been extended to handle the concept of partial truth, where the truth value may range between completely true and completely false. Furthermore, when linguistic variables are used, these degrees may be managed by specific functions. Irrationality can be described in terms of what is known as the fuzzjective.

Fuzzy rules for motor rotation can be defined as:

1. It has two input variable A & B and two output variable C0 & C1.
2. mf1 is defined for logic 0 (0 volts)
3. mf1 is defined for logic 1 (5 volts)

can be implemented as

1. If (Sensor_A is mf1) and (Sensor_B is mf1) then (C0 is NOT mf1) (C1 is mf1) (1)
2. If (Sensor_A is mf1) and (Sensor_B is mf1) then (C2 is NOT mf1) (C3 is mf1) (1)
3. If (Sensor_A is mf1) and (Sensor_B is mf2) then (C0 is mf1) (C1 is mf2) (1)
4. If (Sensor_A is mf1) and (Sensor_B is mf2) then (C2 is mf1) (C3 is mf1) (1)
5. If (Sensor_A is mf2) and (Sensor_B is mf1) then (C0 is mf1) (C1 is mf1) (1)

6. If (Sensor_A is mf2) and (Sensor_B is mf1) then (C0 is mf1) (C1 is mf2) (1)
7. If (Sensor_A is mf2) and (Sensor_B is mf2) then (C0 is mf1) (C1 is mf2) (1)
8. If (Sensor_A is mf2) and (Sensor_B is mf2) then (C0 is mf1) (C1 is mf2) (1)

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figure 1. implementation using fuzzy logic

2.4 EQUATION

In logic gate operations Boolean algebra is used to equate them.

Let-A be the output of sensor 1, B be the output of sensor 2, C0 AND C1 be the input to motor1

C2 AND C3 be the input to motor2

Thus

$C0 = A^{-1}B^{-1}$ (1)

C1=B (2)

$C2= A^{-1}B^{-1}$ (3)

C3=A (4)

2.5 OP AMP

An OP AMP amplifies the difference of the input to inverting and non inverting pins. The output of photodiode is given to inverting pin of op-amp with other at some reference. The output of op-amp is given to L293D to which motors are connected

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Figure 1. model of the robot in grayscale

3.CONCLUSION

It is concluded that using logic gates to make an edge avoider robot reduces the cost of project and increases the speed of the robot. Further scope of this project is that it can be used to study robotics for beginners. By adding a webcam to the robot, it can be used as a surveillance robot for exams. Further same methodology can be implemented using Fuzzy rules and motor rotation can be implemented using fuzzy controller. “IF– THEN” rule can be used to achieve target.

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