L&T EduTech

Microcontroller based Industrial Applications - Project Statement

NAME: TARUN EASHWAR

COLLEGE: VELLORE INSTITUTE OF TECHNOLOGY, VELLORE

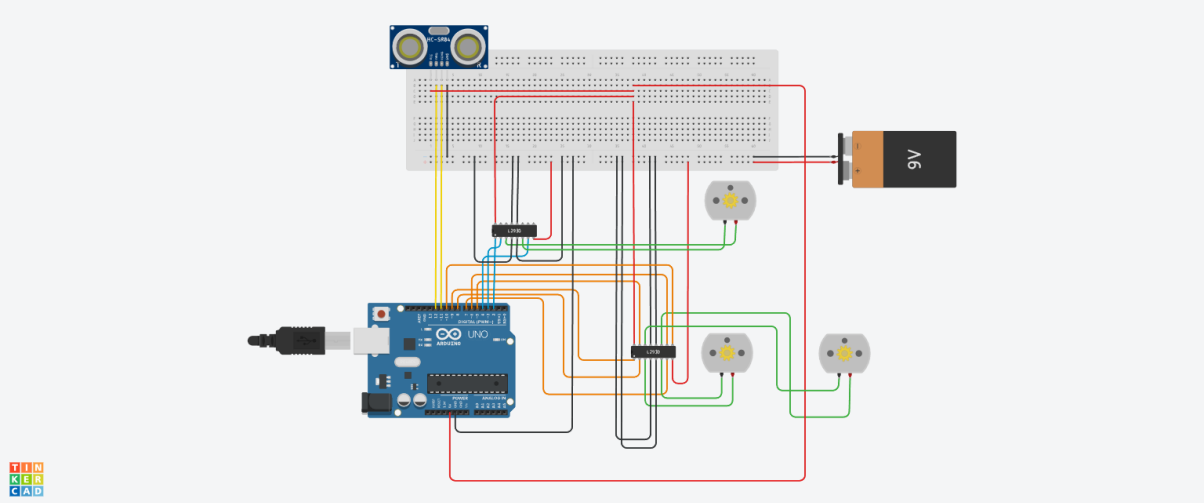
REG NO.: 23BML0094

Problem Statement: To develop a prototype moving structure which can cut grass overheads in a grass yard. (Automatic Grass cutting Robot).

Scope of the solution: The circuit and solution provided shows that, upon a manual addition of a grass cutting blade to the motor and attachment of wheels to the other 2 motors specified for locomotion, the prototype will be able to move and cut grass at a set height as per choice of the user upon fixing the hardware components manually. The grass is cut as long as there is no obstacles detected in proximity of the robot (less than 20cm). Once an object is identified in the 20cm proximity, grass cutting is stopped and the robot proceeds to avoid the object by changing its path by moving backwards and then turning right. Once, the object is cleared of its path, the robot resumes cutting grass and moves forward until an object is met again and the process is repeated.

Additionally, to make this current prototype more effective, efficient and user friendly, a GPS system could also be added thus allowing the user to set a pre-programmed path/route or grid map within a boundary which is to be followed by the robot autonomously. This would make the prototype more expensive, but it will give room for more variations and options to the user to set their own path for cutting grass as required. This feature hasn't been added to the current model, due to lack of resources for implementing a GPS system in TinkerCad. This is just a possibility of innovation which could be added when developing a hardware prototype of the robot.

Simulated Circuit:



[Link to TinkerCad Simulation of my Grass cutting robot simulation]

Required Components:

S.No.	Name of Component	Quantity	Function	Hardware/Software Implementation
1	Arduino IDE	-	IDE Software to use for hardware solution	Software
2	TinkerCad	-	Simulation software	Software
3	H-bridge Motor Driver	2	Control Motor RPMs	Hardware
4	DC Motor	3	2 Motors are connected to wheels for locomotion of the robot. 1 Motor is connected to the grass cutting blade for cutting the grass.	Hardware
5	Ultrasonic Distance Sensor	1	To calculate distance between robot and object as potential obstacle in path (object avoidance)	Hardware
6	9V Battery	1	To power the motor drivers	Hardware
7	Arduino UNO	1	Microcontroller to control the interface of the entire robot	Hardware
8	Wires	-	To connect different components to one another	Hardware
9	Breadboard	1	To distribute power of 9V supply and motor driver connections to all the components.	Hardware
10	Wheels	2	For locomotion of the robot	Hardware
11	Grass cutting blade	1	Attached to the grass cutting motor to cut the grass	Hardware
12	Robot body frame	-	The framework of the entire robot holding all the components in place to perform their functions	Hardware

Result: On running the simulation on TinkerCad, we can see the current status on the Serial Monitor, indicating the distance of the obstacle from the robot and whether the grass is getting cut. At the same time, the motor RPM and its changes can be observed in the circuit.

When the obstacle is more than 20cm away from the robot, the Serial Monitor displays “Grass is getting cut!” along with its distance while the motors spin too.

When the obstacle is less than 20cm away from the robot, the Serial Monitor displays “Object nearby, stopped cutting grass! Robot is avoiding object” along with its distance while the motor connected to the blade for cutting the grass stops until the distance between the object and robot is 20cm away again.

Video of the demo:

>>>Uploaded in GitHub<<<

Gerber file:

>>>Uploaded in GitHub<<<

Code of the solution:

>>>Uploaded in GitHub as Arduino File<<<