

GOVT. COLLEGE OF ENGG. AND RESEARCH
AWASARI (KHURD), TAL- AMBEGAON, DIST- PUNE 412405



CERTIFICATE

This is to certify that following students of T.E. (Electronics and Telecommunication), have done bonafide work on the project entitled – “NUTTY SQUIRREL”.

They are allowed to submit this work to the Savitribai Phule Pune University towards partial fulfilment of the requirement for the award of Bachelor of Engineering (Electronics and Telecommunication) during the year 2018-2019.

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Project Guide

Head of Dept.

Principal

A
Project Report
On
NUTTY SQUIRREL

Guided by
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Submitted By

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Sign of Subject Teacher

INTRODUCTION

Forests cover 31 percent of earth's land and is home for all the plants and animals. These plants and animals are integral to forest ecosystems and provide countless benefits to humans. If we talk about a single animal say, a Squirrel and its lifestyle, Squirrels know when winter is arriving and start searching for food. They gather all the nuts they can during the fall and save them for future. They dig holes and bury the nuts close to their nests so that other Squirrels or animals can't steal them. When they are hungry, they use their strong sense of smell to identify the nuts they have buried. A study from University of California at Berkeley 2017 claims that tree Squirrels use a mnemonic technique called "spatial chunking" to sort and bury their nuts by size, type, and perhaps nutritional value and taste.

In this theme, a robot and a lift mechanism is designed that depicts Squirrel that sorts, carries and places Nuts at different places on land and in trees. The challenges in this theme include Path Planning, building a Lift Mechanism and Simulation. A configuration image is given to teams. The arena consists of thermocol Nuts of different colors that are placed randomly. The robot traverses the arena to pick up a Nut and place it in designated sections S1 or S2. The team needs to make a lift mechanism to lift the bot to certain height to place Nuts at the designated section S3.

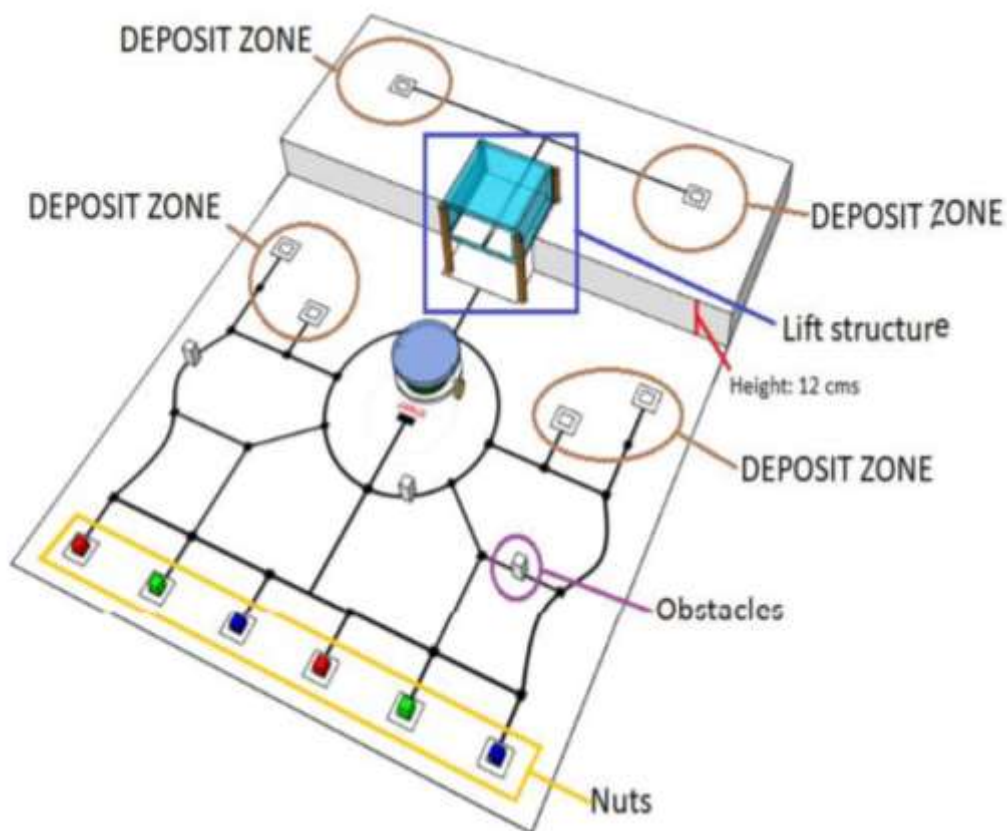
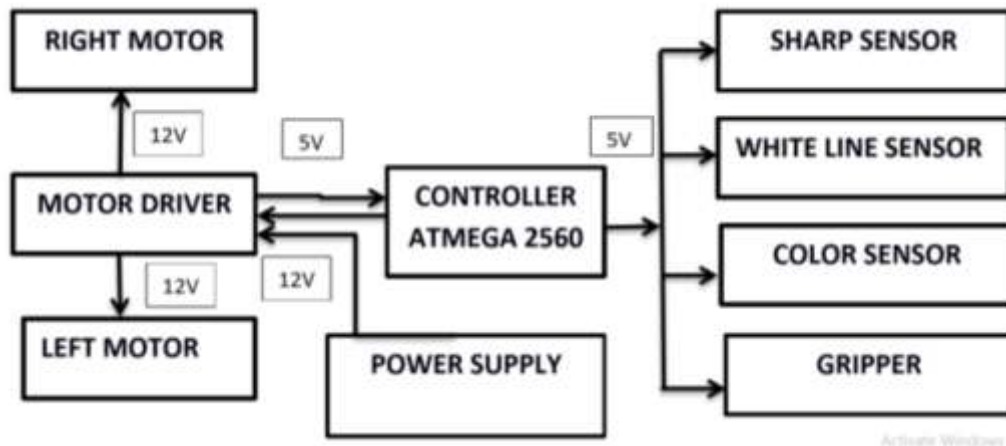


Figure 1.1

SYSTEM DEVELOPMENT

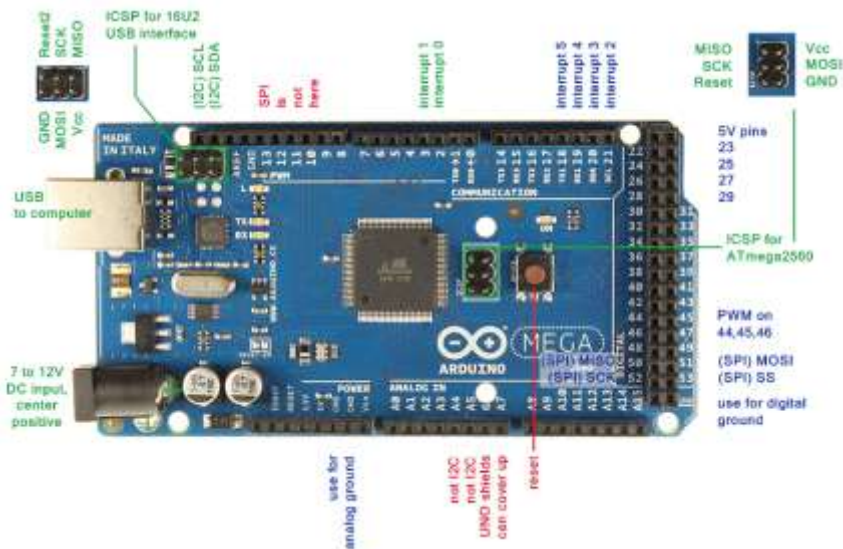
A. Hardware:

ROBOT



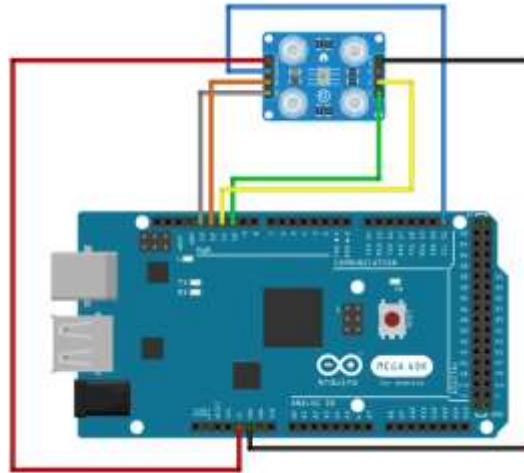
Electronic system:

1. Arduino Mega 2560



The controller performs the various controlling actions & manages communication between different units of system like sensors, actuators, motor driver, etc. for data analysis & further operation.

2. Color sensor TCS3200



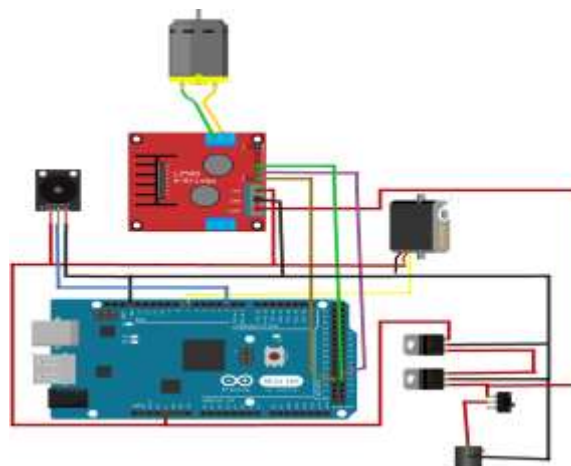
For **TCS3200**, when a **color** filter is selected, it only allows a specific primary **color** to pass through and blocks the other two **colors**. ... When the part of RGB **colors** in the light reflected by the object passes through the filter selected to the TAOS **TCS3200**RGB chip, the built-in oscillator outputs square waves

It contains red, green, blue & no filters which can be scaled by S2 & S3 pin configuration. When the light is reflected back from the object, then the array of photo diode converts the amount of light to current

To detect the nuts of RGB (red, green, blue) color.

3. Motor Driver (L298N):

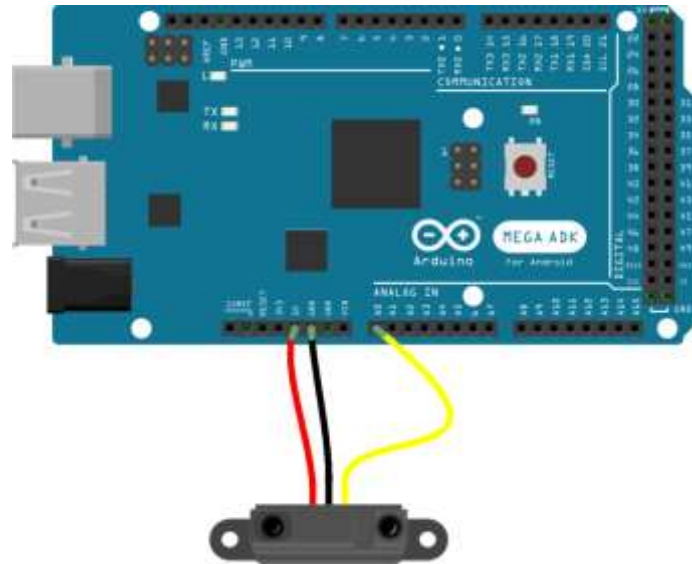
It used to drive DC motors in forward & reversed direction by providing suitable PWM with required current & voltage.



4.Li-ion Battery (2200 mAh, 11V):

To supply the power for the different units of the robot.

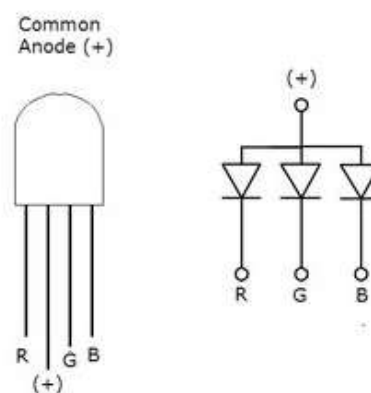
5.Sharp sensor:



It used to detect the presence of obstacle on the way.

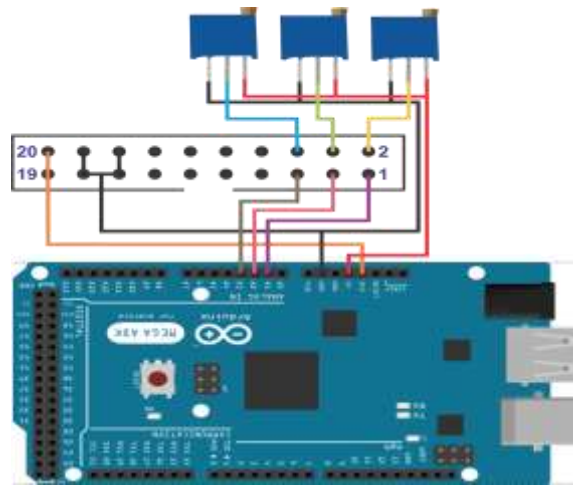
It consists of detector & IR led having fixed distance & orientation to each other. When the light is emitted on the object & reflected back, it is possible to calculate the angle of the light reflected & thereby calculating the distance of object. It is also called as distance measuring sensor. Threshold value: 4cm

1. RGB led:



To glow the appropriate color when nuts of the respective color is detected.

2. Line following Sensor



Line sensors are used for sensing white line on dark surface or black line on light surface. This line sensor board has three line sensors connected together. These sensors working together can follow any curved or zig-zag path. ... This makes this line sensor highly immune to ambient light. It is used to follow the black line & traverse the arena.

Mechanical system

1. DC Motor (100 rpm):

It is used to rotate the wheels in forward & reversed direction for locomotion.

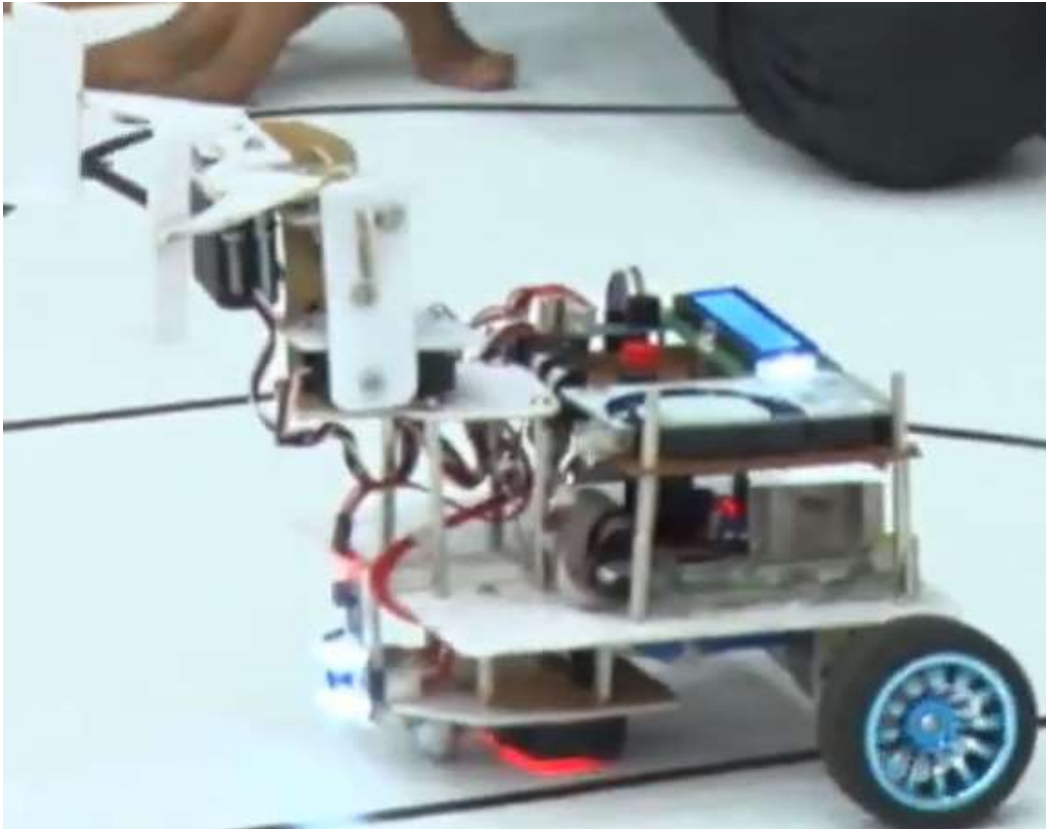
2. Servo Motor:

Two servo motors are used to pick & place the nuts.

3. Chassis:

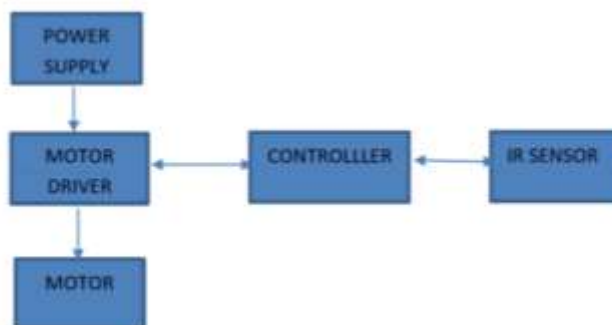
It is the hardware body structure of the robot to constrain all the components required for the robot.

4. Wheels: It is used for the movement of the robot. Caster wheels used for smooth locomotion.



LIFTING MECHANISM

Block Diagram :



Description:

When the robot reaches the lifting area then IR sensor gets activated & sends the signal to motor driver to run the motor initially in counter clockwise direction for some appropriate delay & goes to the upper arena. Again the IR sensor is activated & motor rotates in clockwise direction for downward movement.

Electronic system –

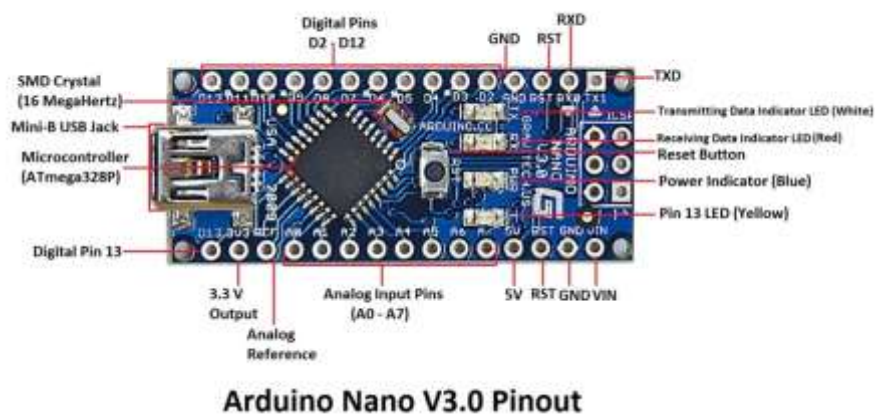
1.IR sensor:

To detect the presence of robot.

2.Motor Driver (L298N):

To rotate the motor in clockwise & anticlockwise Direction with required PWM.

3.Arduino Nano 328:



To take the signal from IR sensor & driver the motor according to signal.

4.Power supply:

To supply the power for the motor driver in lifting mechanism.

Mechanical system-

1. DC Motor (60 rpm):

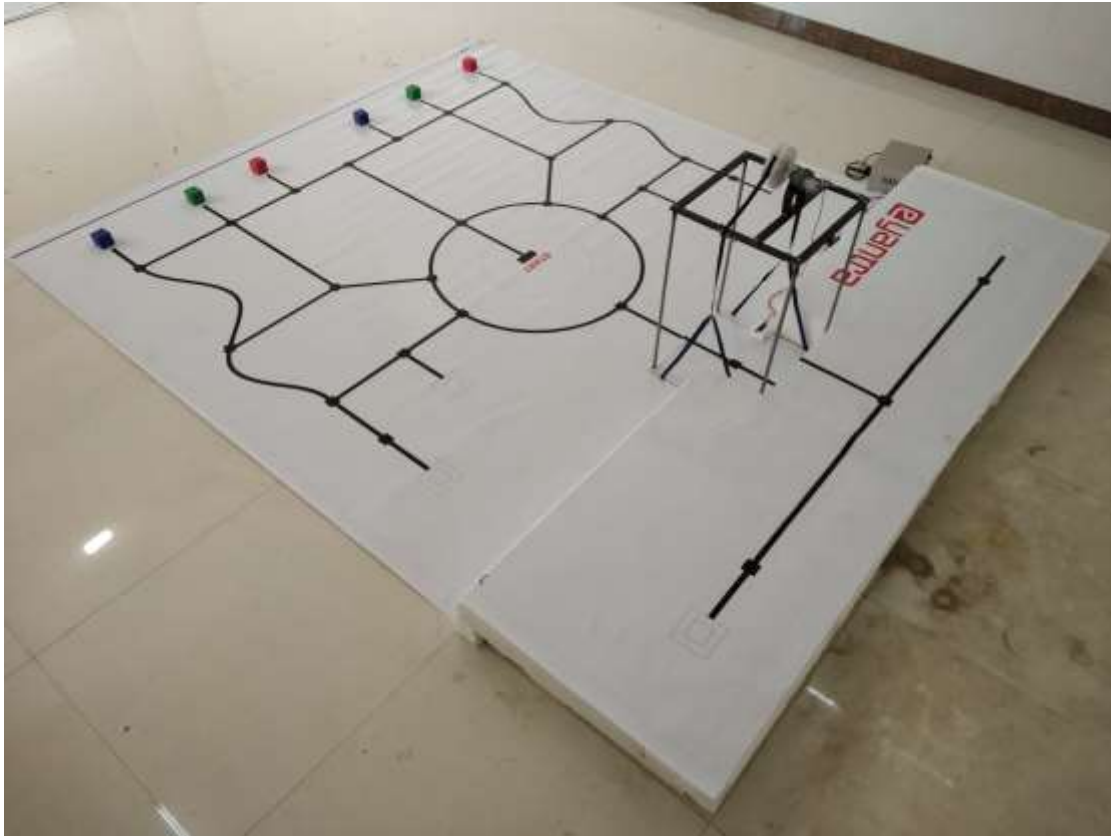
It rotates in anticlockwise direction for upward lift & clockwise direction for downward lift.

2. Pulleys & belt:

To lift the robot & reduce the friction the between belts.

4. Metal frame & rods:

It is the support & body structure of the lifting mechanism.



B.Software

ATMEL STUDIO 7.0

Studio 7 is the integrated development platform (IDP) for developing and debugging all AVR® and SAM microcontroller applications. The Atmel Studio 7 IDP gives you a seamless and easy-to-use environment to write, build and debug your applications written in C/C++ or assembly code. It also connects seamlessly to the debuggers, programmers and development kits that support AVR® and SAM devices.

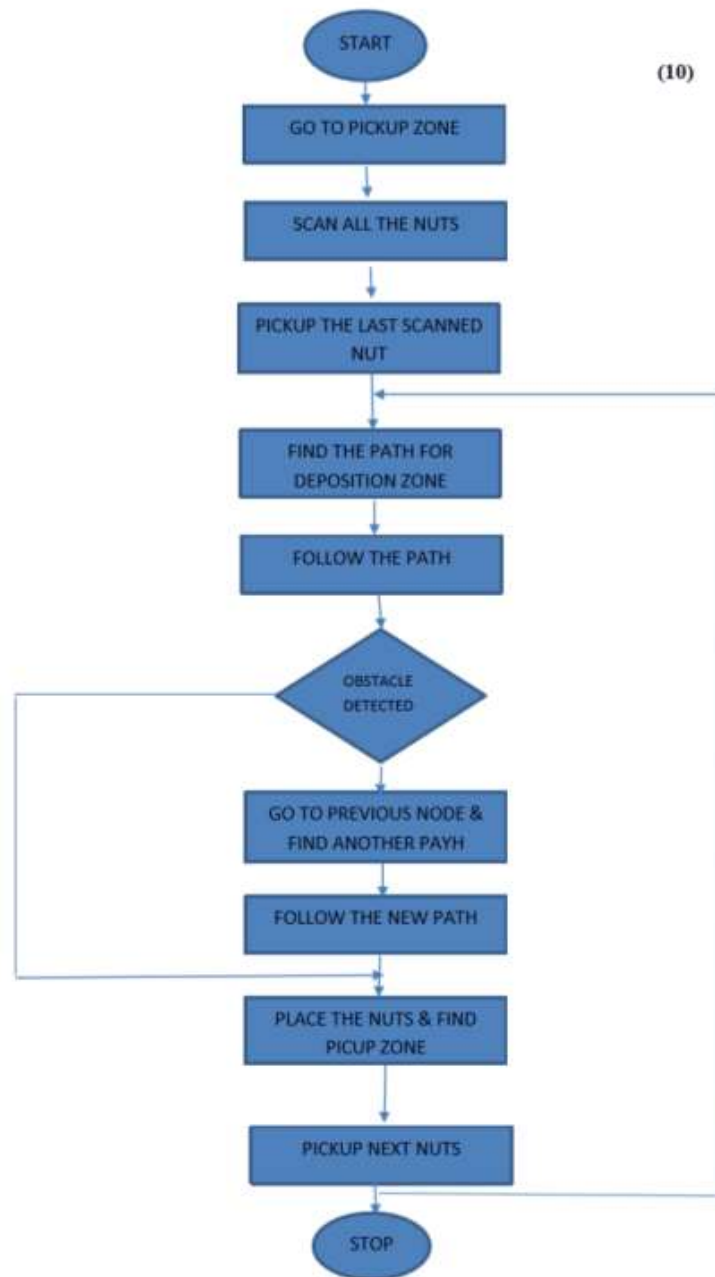
Additionally, Studio includes Atmel Gallery, an online app store that allows you to extend your development environment with plug-ins developed by Microchip as well as third-party tool and embedded software vendors. Studio 7 can also seamlessly import your Arduino sketches as C++ projects, providing a simple transition path from Makerspace to Marketplace.



Algorithm:

1. Start
2. Firstly we can give the individual character to each node of arena.
3. Now, we can make the graph of arena according to the characters given to each node.
4. Apply the Dijkstra algorithm and find the path for starting position to reach the pick up zone and store the path in stack.
5. Then pop the 3 node characters and go from 1st node to 3rd node (the path for each 3 node is already mention in graph)
6. After reaching to the pickup zone we can scan all the nuts and store it color in array according to which color is detected.
7. After scanning all the nuts we can pick up the last nut which is to be lastly scanned and place it in their respective deposit zone
8. .If the obstacle is detected in path then we can go to previous node store it and again apply the algorithm for deposit zone and choose another path.
9. After reaching the deposition zone place this nuts and again go back to pick up zone and pick the nuts which is to be nearby the current position of robot
10. Similarly we can pick and place all the remaining nuts by following the algorithm.
11. To place the green nuts, lifting mechanism is used when robot is reach at lifting area, IR sensor is activated and which creates upward movement of the robot to go to upper arena to place the nuts and come back to lifting area where IR is activated once again and creating downward movement & continues the further operation & at last again it reaches the start position.
12. End

FLOWCHART:



FUTURE SCOPE AND APPLICATIONS:

The path planning plays a vital role in this theme. It reduces the time complexity by perceiving the shortest path by avoiding obstacles. It has wide & real time based applications in various field like

1. Gaming (2D & 3D).
2. Navigation (road, topological) .
3. Telephone network.
4. Flight agenda.
5. Pick & place, lifting mechanism used in automobile industry for heavy load & risky operation reducing man power.

CONCLUSION

The project "Nutty Squirrel Theme" includes the implementation of various concepts in real time based applications like Path Planning to find the optimal path to reach the destination by reducing time complexity in fields like Gaming (2D & 3D), Navigation (road, topological), obstacle avoidance, color detection to detect red, green, blue green which helps in sorting various colour based object modules, pick & place mechanism which play an important role in robotics.