TRAINING BUDDY

Intelligent Table Tennis Robot

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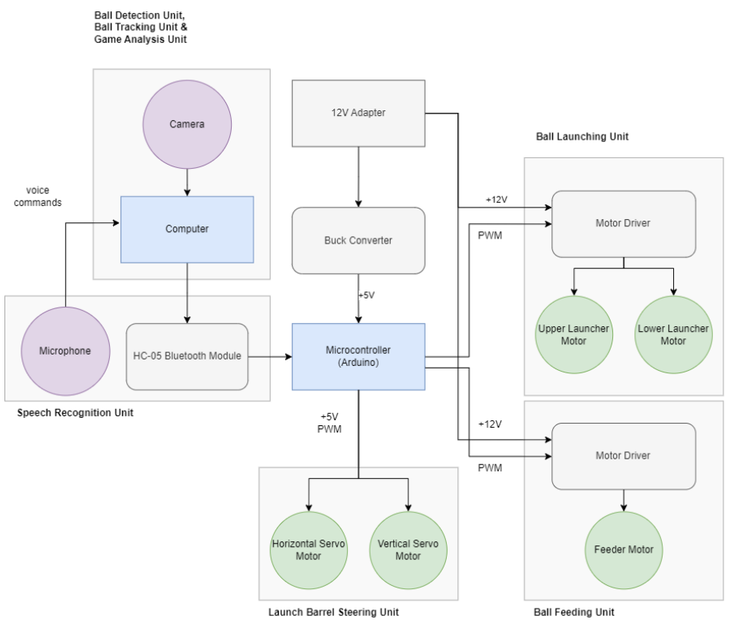
PROJECT DESCRIPTION

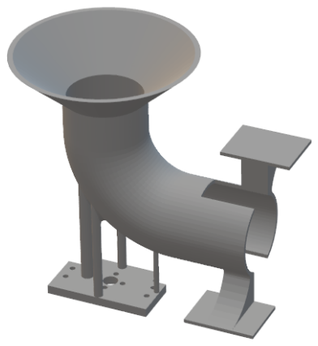
- The "Training Buddy" is an intelligent robot designed to help table tennis players improve their skills at home.
- The robot can be controlled through voice commands and provides feedback to the user.
- The robot can be programmed to simulate various game modes and playing styles.
- It features durable mechanical structures for long-lasting performance.

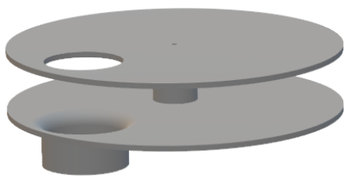
SOLUTIONS

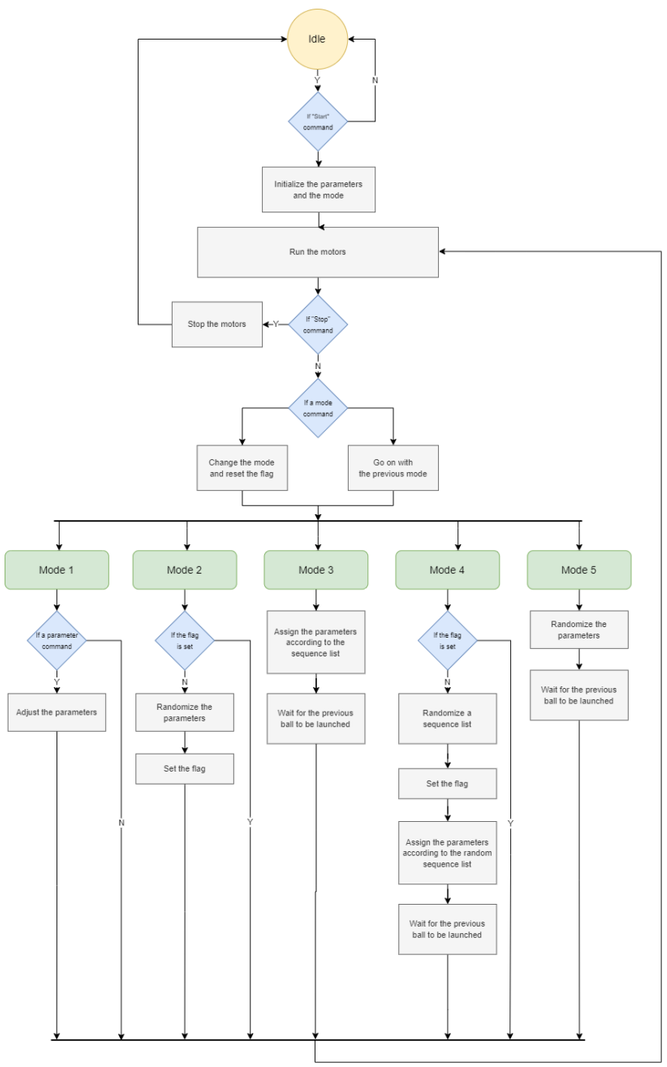
- Yolo aupported image processing algorithms to track the balls and analyze the game. To track more than one balls, an algorithm based on confidence tracking system is implemented to analyze the game for each ball independently.
- A speech analyze system that has a wake up word "Alexa" and speech recognition api supported voice commands
- The communication between the device and computer is made by bluetooth. Each voice commands sends encoded data through bluetooth to the microcontroller inside the robot and robot operates according to the processed algorithm related with the incoming data.
- Two high RPM rated micro DC motors to have a wide range of controll while throwing the ping pong balls at different variations.,
- Two strong servo motors to rotate the system in 2 degree of freedom motion (Up-Down, Left-Right)
- A step motor in the upper part of the robot (feeder) to control the serve frequency
- Mechanical system for a firm stand.

DESIGN









TECHNICAL SPECIFICATIONS

- **Robot Dimensions:** 83 cm vertical height 34 cm long edge lenght and 26 cm short edge length.
- **Structural Weight:** 2.7 kg without balls in feeder
- **Operating Range:** The distance between the PC and robot should stay under 8 meters in range, player with the bluetotth headphones should stay under 10 meters in range for propoer operation
- **Average Power Demand :** It works with 12 V 2A rated adapter in the highest load (full speed and full torque) operation it draws 0.4 A. Total power is 3.6 Watt.

USAGE

1. Open the GUI from the exe file and connect to the robot.
2. User can activate voice commands from the GUI or can give direct commands from the word box
3. When voice commands is activated user should wear the headphones and must move to the opposite side of the table to avoid being affected by the robot's noise.,
4. User should say the wake up word "Alexa" before each commands, after the "Alexa" wake up user have 4 seconds to give voice commands which is more than enough for all of the available commands

FEATURES

- Compatibiliy with Windows/Linux PC over a bluetooth communication
- Smartphone supported gameplay recording with a tripod phone holder to locate camera
- Hands-free voice control with bluetooth headphone and additional gui control which can be accessed through an .exe file (download link will be given with the product).
- An image processing algorithm to track the user, balls and analyze the performance of the user during the game.
- Different throwing speed, throwing spin, throwing angle and direction to simulate a human like player with extreme complexity.
- Different preset, sequenced or randomized game modes to select.

DELIVERABLES

- Mechanical Structure with Built-In Plug and Play Robot
- Tripod for a Phone Placement
- 10 Ping-Pong Balls Suitable for the Robot
- Link to the Downloadable .exe files

COST ANALYSIS

Items	Price
Arduino Uno	15$
Two Motor Drivers “LN298N”	4$
Two DC Motors “6000RPM MicroDC”	16$
Pan-Tilt System w Two Servo Motors “MG996R”	20 $
2 Rubber Wheels	5$
Breadboards, Wiring and Jumpers	5$
Bluetooth Sensor	4$
Camera Stabilizer Tripod	6$
Buck Converter for DC Volt Regulation	1$
Step Motor “28 BYJ-48”	2$
Power Adapter	4$
Mechanical Structure	5$
3D Printed Systems	10 $
TOTAL	**97 $**