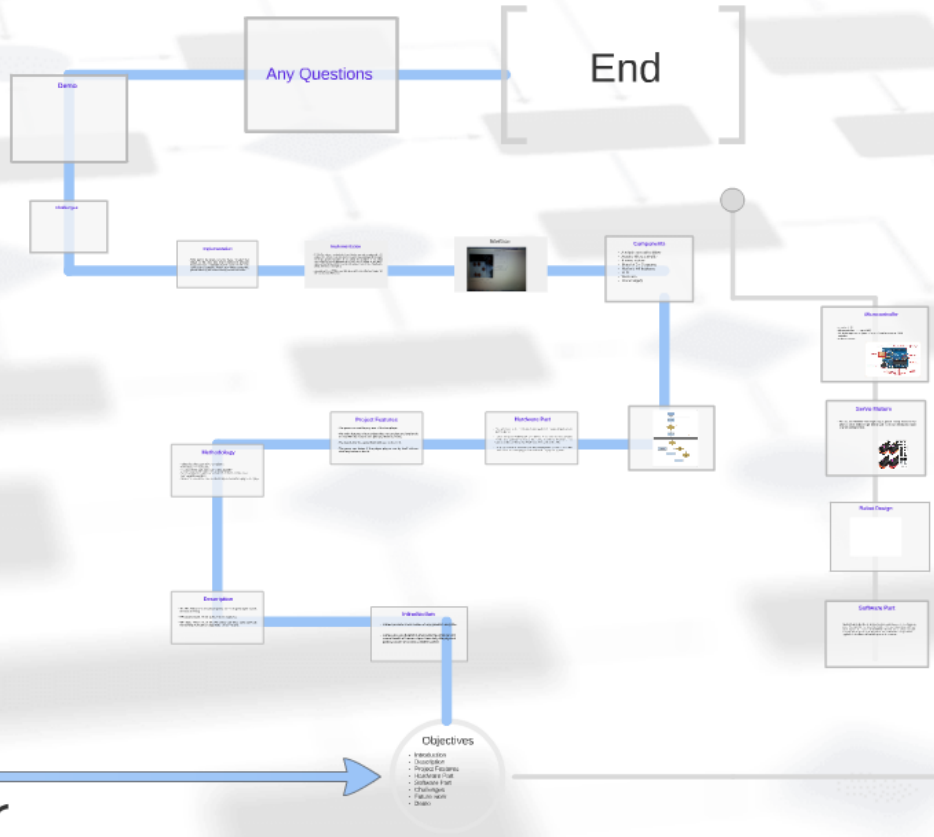

TIC TAC TOE

Israa Salameh & Rudab Naser

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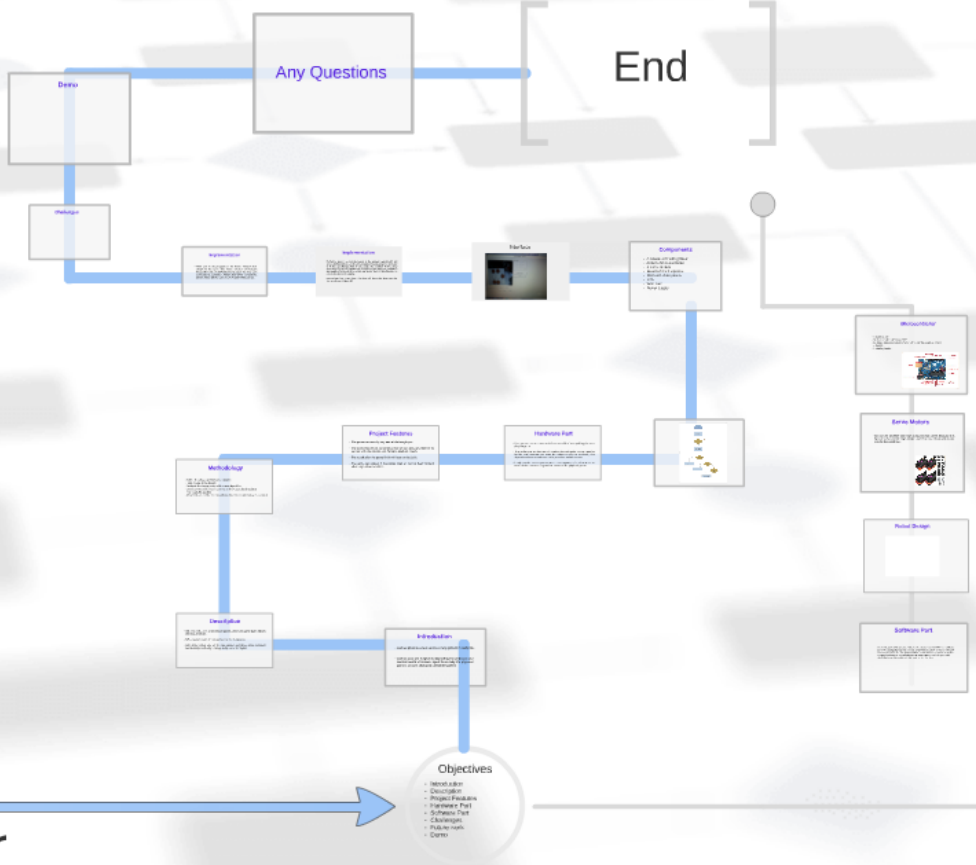


Objectives

- Introduction
- Description
- Project Features
- Hardware Part
- Software Part
- Challenges
- Future work
- Demo

Introduction

- Games provide a real source of enjoyment in daily life.

- Games also are helpful in improving the physical and mental health of human. Apart from daily life physical games, people also play computer games

Description

- TIC TAC TOE ,It is a two player game, zero-sum game (gain equals the loss of other).
- N*N square board . In our game, it is 3 x 3 squares.
- Win state: when one of the two player get three same symbols horizontally, vertically or diagonally - on a 3 x 3 grid.

Methodology

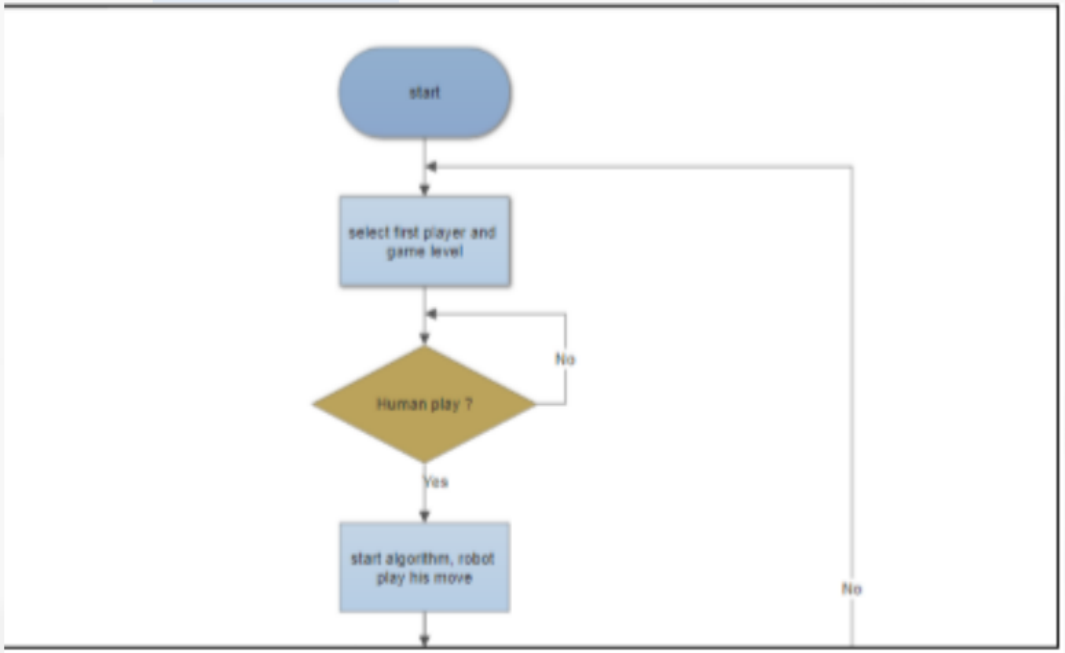
- Robot that play against human player;
- Take image of the board;
- Analysis the image using alpha beta algorithm;
- Send command to Arduino to make the robot take the piece from specific position;
- Move it to one of the nine positions depend on which player was play.

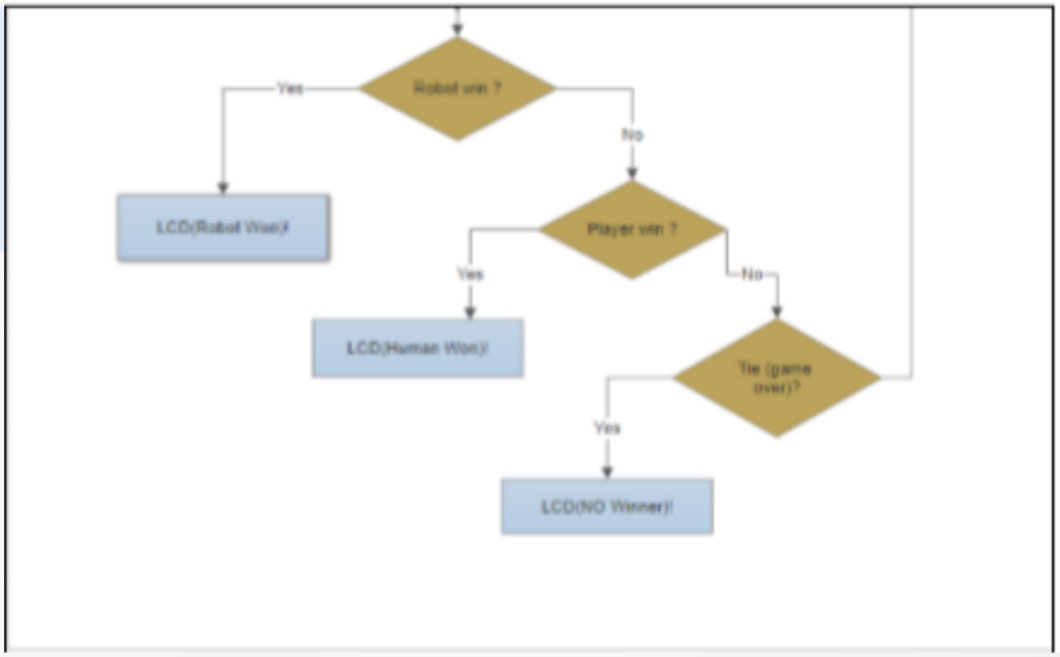
Project Features

- The game can start by any one of the two player.
- The main features of our project that we can play any level of tic tac toe with the robotic arm (Simple, Medium, Hard).
- The result after the game finish will see on the LCD.
- The game can detect if the player play or not by itself without click any button to hint it.

Hardware Part

- First we constructed a mechanical arm capable of manipulating pieces to play the game.
- Then in this part we determine the values for each motor on each position for the nine positions and store the values in different functions, then depend on the command received by serial we control the arm.
- Lastly and the most important was the development of code to translate move of the tic-tac-toe program into actions of the physical system


start
select first player and game level
Human play ?
No
Yes
start algorithm, robot play his move
No

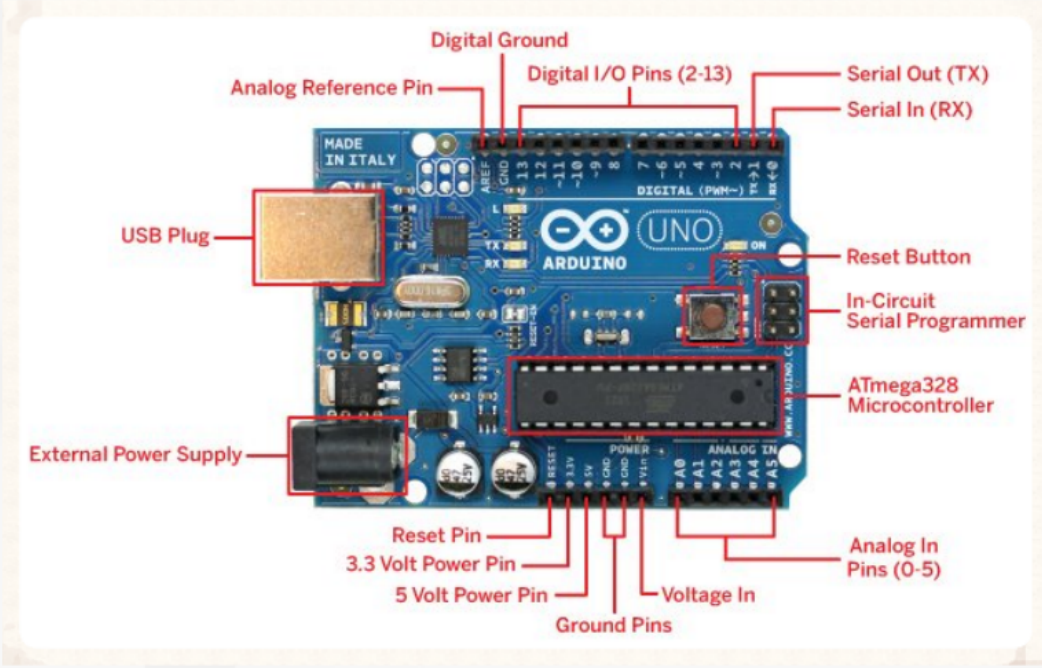

Robot win ?
Yes
No
LCD(Robot Won)!
Player win ?
Yes
No
LCD(Human Won)!
Tie (game over)?
Yes
LCD(NO Winner)!

Components

- A robotic arm with gribber
- Arduino Microcontroller
- 4 servo motors
- Board of 3 x 3 squares
- Red and white pieces
- LCD
- Web cam
- Power supply

Microcontroller

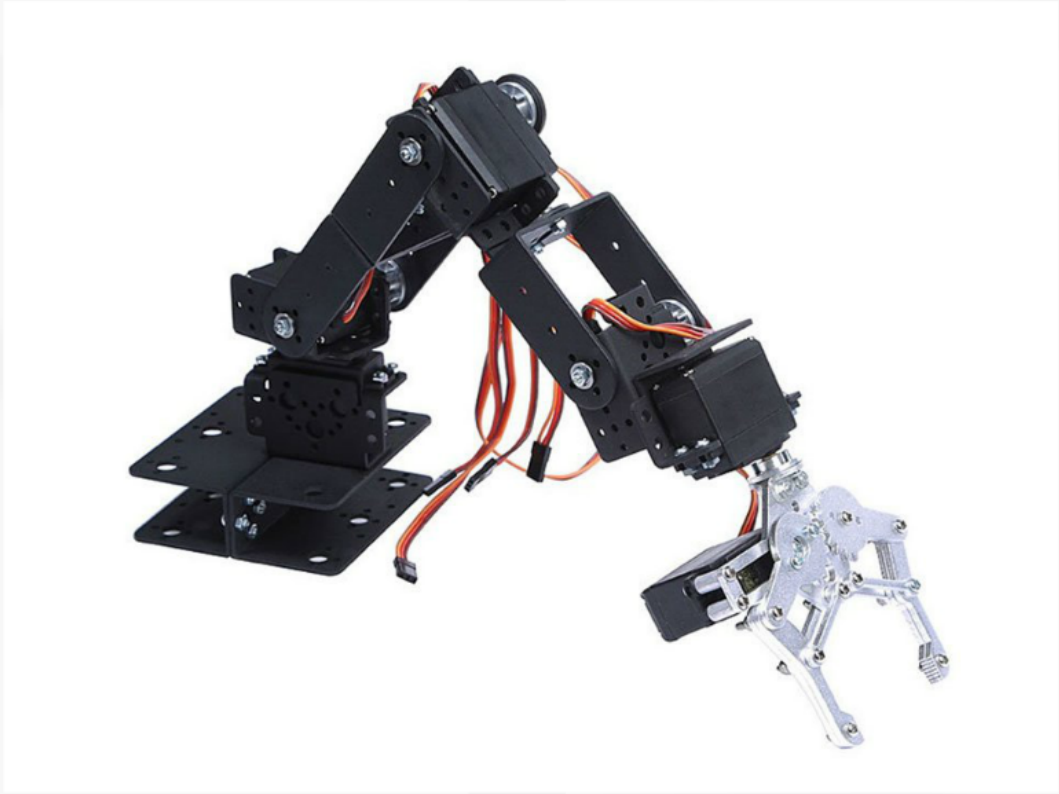
- Arduino UNO
- Microcontroller : ATmega328P
- 14 digital input/output pins (of which 6 can be used as PWM outputs).
- 6 analog inputs.



Servo Motors

- We use the MG996R with high torque (metal servo) because this type of servo endure high torque and if we use the plastic motor may be damaged fast.

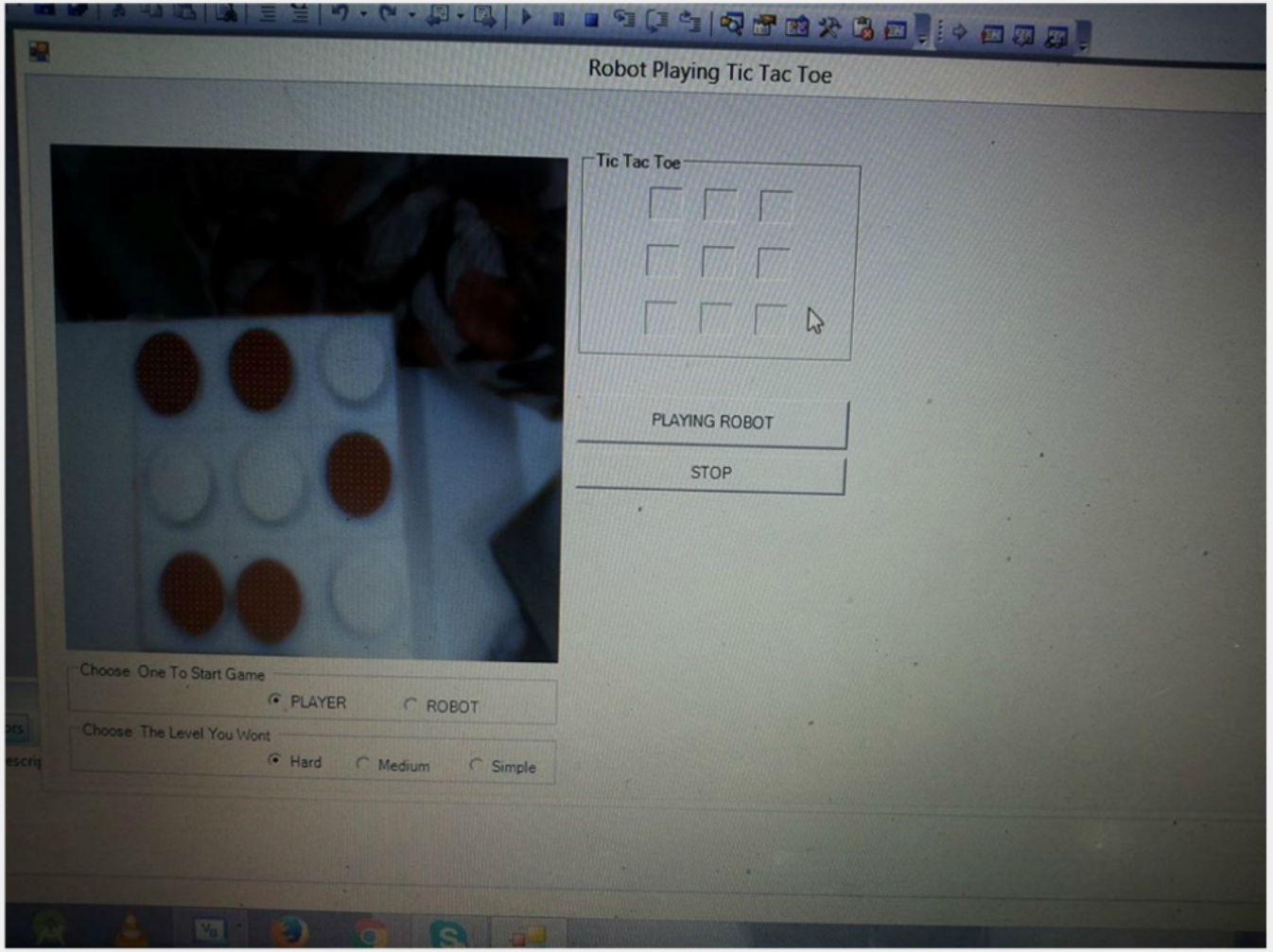
Robot Design



Software Part

We build application by using visual basic program to deal with the hardware part. This application consist of three parts these are communicate with each other to play a Tic Tac Toe game between robot and human player using the image processing to analyze the picture from camera and the alpha beta algorithm to determine the suitable position for the robot.

Interface


Robot Playing Tic Tac Toe
Tic Tac Toe
PLAYING ROBOT
STOP
Choose One To Start Game
PLAYER
ROBOT
Choose The Level You Wont
Hard
Medium
Simple

Implementation

- TicTacToe class : control the board in the project; consist off 3*3 array and function to set the current player; may be player X or player O in the specifid position in the array; the poistion in the array speciefied by the AI algorithim in AI class for the player O, and when any position in the array is set by any player there is two function to detect the win or the eqality.

- Second part is a TTTAI class this class will detect the best move for the robotic arm (Player O)

Implementation

- Third part in the program is the frame window that shown to the user, this frame consist of webcam image with size of 360*360 pixel to open the web cam connected to computer ,Picture Box which consist the picture taken by the camera every 200 milliseconds.

Challenges

Demo

Any Questions

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