

CS 101 PROJECT

AIR HOCKEY

MONDAY LAB BATCH 161
Project Report - Stage 2 submission

Introduction

This project is a game application made using EzWindows. It is based on the game/sport known as “**Air Hockey**”.

Air hockey is a game for two competing players trying to score points in the opposing player's goal. Air hockey requires an air-hockey table, two player-held mallets, and a puck. A typical air hockey table consists of a large smooth playing surface, a surrounding rail to prevent the puck and mallets from leaving the table, and slots in the rail at either end of the table that serve as goals. Additionally, tables will typically have some sort of machinery that produces a cushion of air on the play surface through tiny holes, with the purpose of reducing friction and increasing play speed. On the ends of the table behind and below the goals, there is usually a puck return. Air Hockey pucks are slim discs made of Lexan polycarbonate resin. Standard USAA-approved pucks are the yellow lexan, red lexan and the Dynamo green. In competitive play, a layer of thin white tape is placed on the face-up side.

The project is designed to be on the same lines.

Game design

We have very systematically designed the game to proceed in a series of interlinked windows. The details of which are as follows:

(1)The “AIR HOCKEY. Click to continue” window is the first window that opens.

(2)Succeeding it is the Starting window which consists of options NEW GAME, HELP and QUIT.

(3)On clicking the NEW GAME button you will be asked to enter the

name of the Player. This is supposed to be done in the terminal. After the name is entered, the “Gameplay” window opens.

(4)The “Gameplay” window is the Main window in which the game runs. This window transports you to a white rectangular Gameplay arena where the game has to be played.

(5)As soon as a player hits a goal a message is displayed saying that a particular player has scored.

(6)Whenever a 7 goals are scored by the player or the computer, an alert message pos up and tells the result of the match. On clicking OK, the game gets over.

(7)There is also an Instructions window which gives shows the rule of the game. It opens on clicking on the “HELP” button in the Main Menu.

Game Features:

The Gameplay Window has three objects moving around – The Puck and the two Paddles(instead of the Mallets).

The Puck is circular while the Paddles are elongated and rectangular.

The paddles can move both vertically and horizontally, The paddle on the left is restricted to move only in the left 20% width of the field. Similarly, the right paddle is restricted to move only in the right 20% width of the field.

The goal-posts are located along the left and right boundary of the table/field.

The collisions of the puck with the boundaries and the paddle are assumed to be elastic.

The paddles will be assumed to be smooth so that there is no frictional impulse(parallel to the surface of the paddle) during the collisions with the Puck.

Game Controls:

The Puck movement is Computer Controlled. The Paddle on the right hand side is Computer controlled while the one on the left hand side is User controlled. You have to give a mouse-click to move the paddle in that direction.

Puck Motion:

The puck moves through the arena, bouncing off the boundary of the arena according to the laws of reflection. On colliding with a paddle, the pucks's velocity is determined by the place where the ball hit the paddle. On collision with the 'Goalpost' behind the paddle of any player, the opponent player scores and the puck reappears at a random location.

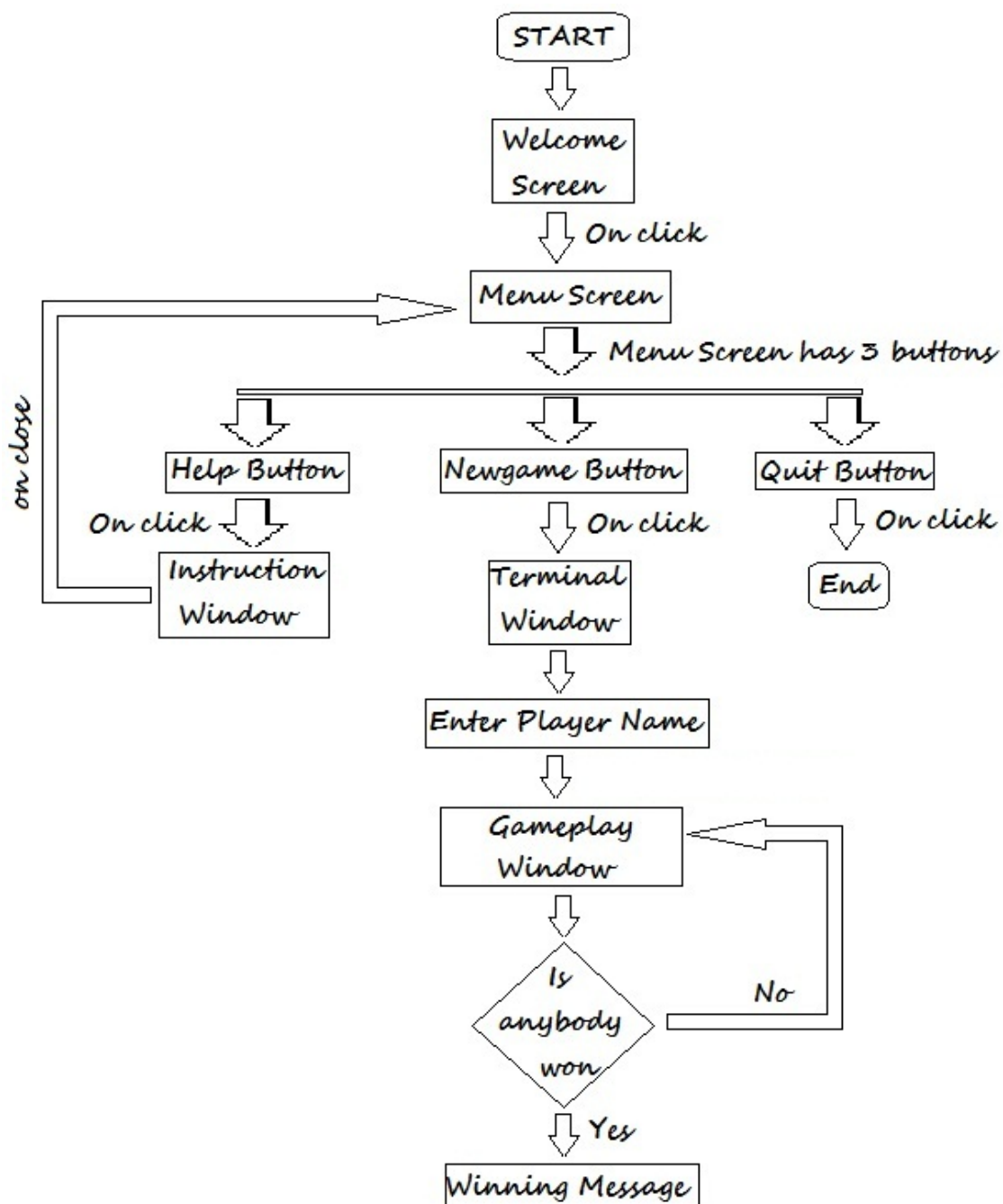
Scoring:

You have to try making the puck touch the wall behind the opponents paddle in Order to score. You also have to stop the puck from colliding with the wall behind your paddle so that the opponent does not score.

Game End:

The game ends when any player scores 7 points.

The general features of the game can be understood using the following flowchart:-



Work distribution:-

We have distributed the work among 2 teams in our lab batch 61.

Team A – Sarode Akshay Sanjay (110260010) (Team leader & coordinator)

Saurabh bhatt (115280021)

Shaikh Nida (115280001)

Team B - Shah alok minesha (110010001) (Team leader)

Shah vraj pranav (11D170001)

Satyabrata das (115060010)

Work handled by Team A :-

Team A will be handling the window in which the game will be played, i.e, the “Gameplay” window. This includes the background(field), displaying of the players' names, movement of the puck, collisions of the puck with the walls , movement of the paddles.

Work handled by Team B :-

Team B will be handling the windows other than the “Gameplay” window. The work of making the buttons, the links with the buttons, the background graphics, and other graphic elements such as effects when a button is pressed, etc.

Individual Contributions :-

Team A:

Sarode Akshay Sanjay(110260010)(Team Leader and co-ordinator):-

- Actively participated in all the team meetings.
- Suggested the project Air Hockey and some other topics.
- Wrote the code for movement of the puck.
- Made the images for the puck and the paddles.
- Wrote the code for Mouse-click paddle movement.
- Also wrote a partially working code for using keyboard input, which was encountering problems due to the timer function. Discarded the idea due to lack of time and used mouse instead.
- Wrote the working code for collisions of the paddles and puck with the walls and with each other.
- Wrote the code for the random release of the puck after each goal is

scored.

- Improvement of scoring code and wrote a shorter code for it.
- Integrated codes of Team A and Team B.
- Linking windows.
- Debugging the program.
- Wrote the SRS Documentation for stage 1.
- Added comments into the final code.
- Added alert messages into the code to make things clearer to the user.
- Added to the final project report by adding the logic, limitations and thoughts for improvement for our code.

Saurabh Bhatt(115280021):-

- Actively participated in all the team meetings
- Suggested a few topics for the project.
- Wrote the code for construction of the gameplay window and the field.
- Wrote the code for computer controlled paddle(Artificial Intelligence).
- Wrote the code for scoring.
- Tried to write the code for collisions.

Shaikh nida fazlur rehman(115280001):-

- Actively participated in most of the team meetings.
- Suggested a few topics for the project.
- Construction of partially working collision code. Genuinely tried to debug it, but was unsuccessful.
- Wrote a partially working code for Mouseclick Paddle movement.
- Wrote the Final Project Report.

Team B:

Shah Alok Minesh(110010001)(Team B leader):-

- Actively participated in all the lab meetings.
- Suggested a few project names.
- After the main project was chosen, suggested some features that our game would contain.
- Downloaded blank buttons from the internet for our game's main menu and edited them to suit the program.

- Also downloaded and edited the background images and the starting window image.
- Studied EzWindows and tried to explore additional features on internet.
- Wrote the code for the main menu designing and the mouse click events in the main menu.
- Also created the starting window and added mouse click event in it for the main menu to appear.
- Arranged the team meeting for Team B for practising EzWindows.
- Also tried adding an additional window after completion of game for replaying the game or quitting it, which didnt work out well due to looping of mouseclick events.

Shah Vraj Pranav(11D170001):-

- Actively participated in all the lab meetings.
- Suggested a few project names.
- After the main project was chosen, suggested some features that our game would contain.
- Helped Alok in choosing buttons for the game.
- Studied some basic concepts of EzWindows.
- Wrote an odt document for the instructions window and formatted it by myself.
- Wrote the code for the instructions Window.

Satyabrata Das(115060010):-

- Actively participated in all the lab meetings.
- Suggested a few project names.
- After the main project was chosen, suggested some features that our game would contain.
- Studied EzWindows and some of its basic features.
- Made a window for taking user input for name, which didnt function properly.
- Suggested the idea of terminal input after the window idea was dropped.
- Wrote the code for terminal user input.

DESCRIPTION OF PROGRAM LOGIC/ALGORITHM:-

1. Arena – The arena is constructed using simple `RenderRectangle` functions.
2. Puck and Paddles – These are simply `.xpm` images which are displayed in the Arena.
3. Movement of the Puck and Paddles – The images appear to move by using a timer function to be called every millisecond. This timer function erases the images and redraws them at their appropriate new positions every time it is called.
4. Collisions of the Puck and Paddles with the walls and with each other – This is done by reversing the signs of the appropriate components(x or y components) of the velocity.
5. Control of the left paddle using mouse click – This is done by obtaining the x and y co-ordinates of the point where the mouse is clicked and using `arctan` function to find the angle and then the paddle's x and y velocity components are set using cosine and sine functions respectively.
6. Artificial Intelligence of the computer controlled paddle – The computer controlled paddle is designed to be unbeatably intelligent. This is done by telling the computer paddle to continuously track the puck in the y direction. When the puck comes near the paddle, the paddle moves towards the puck, hits it and returns back and continues tracking the puck. However, we made this computer to make errors at a probability of 1/2 in order to make the game sensible.
7. Every time a goal is scored, an alert message pops up. On clicking OK, the puck is sent from the middle of the field in a random direction at a fixed speed. This random direction is achieved using the `rand()` function. The angles are made properly random by everytime giving a new seed to the `rand()` function using `srand(time(0))`.

STATUS OF COMPLETION:-

The project is fully completed as planned. Only change from the SRS that we made is that the player's paddle is controlled using mouse-clicks and not the keyboard.

SHORTCOMINGS:-

One of the shortcomings of the game is that when the paddles try to push the puck inside the walls, it actually does go inside the walls sometimes, instead of getting bounced back, and inspite of having written the code to prevent this. Apart from this, there is no major shortcoming in our game as such.

FUTURE IDEAS:-

One can improve the Artificial Intelligence of the game. The AI is designed to be actually continuously track the puck and hence is unbeatable. We made it beatable by adding a probability of 1/2 of it staying at the same place when the timer function is called every millisecond. This however, can be improved, as in our code the computer kind of teleports the paddle after stopping for a while and continues tracking the puck.

Also, we can add some options to decide the level of difficulty.

The game will be even more fun to play if the keyboard controls the paddle. This can be an improvement in the game.