Tank Tag

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***Abstract*— This paper proposes an IOT based game for players to relax and entertain themselves in their busy and stressful daily schedules. Tank Tag is a game where two tanks are controlled with an Android Application (made with the help of MIT app Inventor 2 website) via Bluetooth. This android application controls the tank, displays a Timer and Opponent's Tank health. The android application is linked with the Google's real time database "Firebase". A Scoreboard webpage is provided which retrieves both tanks' health and also provides parental controls of Android Application to Start the game and Reset the health of both the tanks.**

Keywords*— *IoT, Sensors, Entertainment, Arduino Uno, Firebase, Android Application, MIT App Inventor.

I. INTRODUCTION

Tank Tag is a game where two tanks are controlled with an Android Application (made with the help of MIT app Inventor 2 website) via Bluetooth.

The rules of the game are pretty simple, just shoot your laser at the opposing tank and hit it till the health points reach 0 or when the time runs out eventually. This consists of two tanks facing each other at every instance.

The game is pretty simple and an excellent and a popular source of entertainment. Though the game can be conducted manually, it often needs elaborate preparations. The final output is envisioned to be a user-friendly interactive gaming session with which the user can get entertainment with value-addition.

This tank tag game is based on the video game World of Tanks. The tanks are controlled wirelessly with android devices via Bluetooth and a basic GUI is provided on the android application for the same. Also Firebase is used to display opponents health and for the scoreboard for the audience to view the score easily.

II. REVIEW OF LITERATURE

A project named WW2 Laser Tank Tag is designed used Raspberry Pi Zero Wireless, laser diodes and many more such expensive components and it wasn't even wireless [2].

The Arduino Uno R3 is a microcontroller board based on ATmega328 (datasheet).

A website called MIT app inventor, readymade tools are provided to build your required application, and first we started with controlling a LED wirelessly and build the android application for the same. In this way we learned two way communication between android application and Arduino which helped in sending data to android application from Arduino whenever the laser beam was incident on the LDR sensor [2]. To view the opponent's health on the android application we used Google's real-time database "Firebase" in which the health of both the tanks are updated whenever they are hit and retrieve opponent's whenever they hit their opponent [7].

A score board is built using JavaScript and HTML which fetches the health of both the tanks and displays it in the real-time. A basic HTML webpage containing tables, buttons, and labels is used in the Scoreboard Webpage [8].

III. PROPOSED SYSTEM

The block diagram of this game is shown below in the Fig.1.

- The App is developed on MITApp Inventor to control the motors with arduino via bluetooth.
- Firebase is a mobile and web application development platform and provides real-time database for developers and learners.
- Health of tanks is pushed to firebase real-time database and fetched to website to view the scores.
- The website uses JavaScript to fetch and update the health of tanks in real-time.
- The website has two buttons reset and start which can be used to control the game play.
- Reset button resets the scores and all buttons on the app disappear and when start button is pressed the buttons will appear on the app and a time will start for the game.
- There will two LEDs (Green & Red) which will indicate if the tank has been destroyed with Red LED and with Green LED it will indicate that tank still has some health and can play.

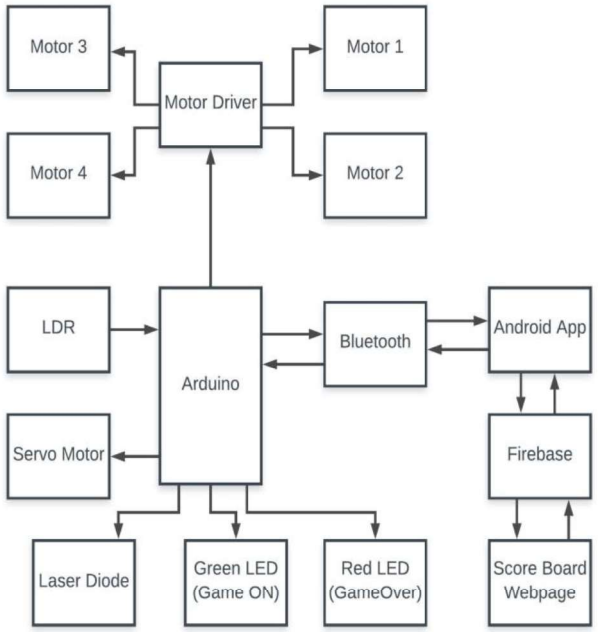

Fig. 1. Block Diagram of Proposed System

IV. HARDWARE AND SOFTWARE REQUIREMENTS

Table I below shows the hardware requirements for the project.

TABLE I. HARDWARE REQUIREMENTS

Sr. No.	Hardware Components		
	Name	***Specification***	***Quantity***
1.	Arduino UNO	REV3	2
2.	Bluetooth Module	HC-05	2
3.	DC Motors	300RPM	8
4.	LDR Sensors	5mm	24
5.	Servo Motors	SG90	8
6.	Laser Diode	5v,6mm	2
7.	LED (red and green)	1 watt	4
8.	Motor Driver	L289N	2
9.	AA batteries	1.5v	16
10.	AA battery Case holder	4 battery in series	4
11.	Battery Connectors	9v battery connector	4

Table II below shows software requirements for the project.

TABLE II. SOFTWARE REQUIREMENTS

Sr. No.	Software Technologies
1.	Arduino IDE
2.	MIT App inventor 2 Website
3.	HTML
4.	Firebase
5.	Web Browser

V. IMPLEMENTATION METHODOLOGY

- First DC motors and Arduino are powered with 12V dc from the AA batteries. Total 8 batteries are connected via a slide switch.
- The app to controls the tanks is developed in MIT App Inventor which is a web application integrated development environment originally provided by Google, and now maintained by the Massachusetts Institute of Technology.
- The Arduino board is connected to the android application via Bluetooth. The screen of android application is shown in Fig.2.
- The tanks movements like forward, backward, left, right, fire and aim can be controlled with the help of developed android app.
- The buttons on the app appear only after the start button is clicked on the website of the Score board shown in Fig. 4.
- The android app also shows the timer and if the time elapsed is 2 minutes then the tank with highest health wins or if both have the same health a pop up comes indicating the tie and nobody won.
- Firebase real-time database is used to store the health's of tanks for real-time exchange,

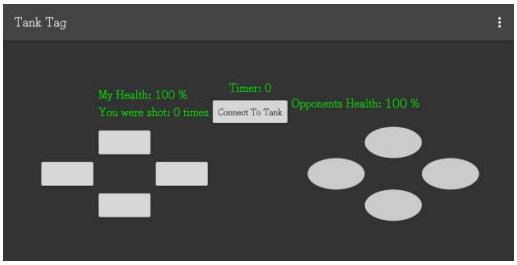

Fig. 2. Tank Tag Android App.

- Firebase's real-time database is used to store the health of tanks for real-time exchange, it is stored in JSON format as shown below on Fig. 3.
- The Firebase Realtime Database is a cloud-hosted NoSQL database that lets you store and sync data between your users in realtime.
- Live health of both the tanks are displayed on a Scoreboard(webpage). This webpage shows the live score during the game play, JavaScript is used to fetch live scores from firebase real-time database.

Fig. 3. Tank Tag Real-time Database(Firebase).

- The two buttons shown in the Fig. 4 i.e. Reset and Start are used control the game and change the value of the "Start" tag in the firebase real-time database.

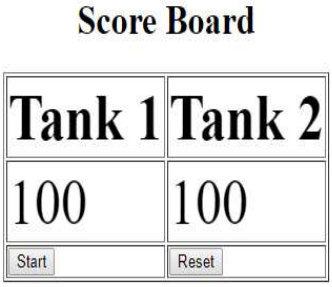

Fig. 4. Tank Tag Real-time Database(Firebase).

- The above Fig. 4 is the screen shot of the webpage in table format that shows the healths of tanks respectively, in real-time during the gameplay.

VI. RESULTS

- The tanks were developed and tested successfully with all the functions properly and below diagram shows the developed tanks.

Fig. 5. Final Prototype

The above diagram shows the developed tanks with the software and hardware requirements specified in Table I and Table II.

- The App Developed indicates the time, tank's health(both my and enemy's) and buttons to control the tanks.

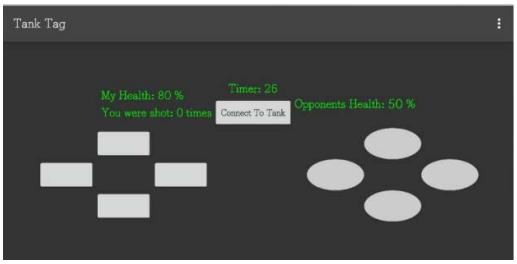

Fig. 6. Android App screen during gameplay.

The above screen shot was taken during the gameplay of the android app developed in MIT App Inventor.

- The scoreboard (webpage) shows the real-time updated health of both the tanks during the gameplay.

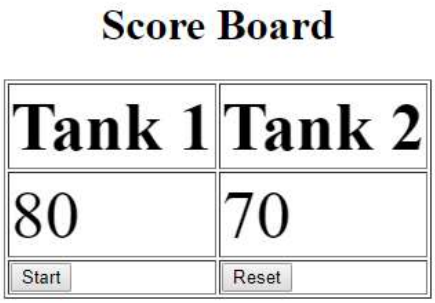

Fig. 7. Tank Tag Real-time Database(Firebase).

The above diagram shows the developed Scoreboard(webpage) with the help JavaScript to fetch data from firebase real-time database and html <table> tag to display the respective healths of tanks in a table format.

VII. CONCLUSIONS AND FUTURE SCOPE

- IoT based tank tag game is designed using Arduino Uno, Laser Diode, Servo Motors, DC motors, Bluetooth module, etc. The project when implemented had the following final prototype,
- Android screens and Score board while playing and testing the game. This refreshes a person's mind make them feel relaxed.
- LDR and Laser Diode can be replaced with IR sensors to hit the opponents tank to avoid interference of light during the gameplay to LDR sensor.
- NodeMCU can be used instead of arduino and Bluetooth connection can be replaced with WiFi connection to increase the range to control tanks.

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