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Report 3

Principle of Operation:

A block diagram is a good visual representation of how the system will function and what components are involved. Apart from showing the components of the system it also shows the direction in which data and voltage will flow through the system. The block diagram helps both the client and designer have a clear understanding of what's going on in the system.

The block diagram shows the way in which the user will interact with the system and how data will be transferred. Included in the block diagram is a mobile application that the user will give inputs to the development board to control the LEDs on the device. The user will then interact with the tactile button switches that will send signals to the development board to control the LEDs.

Everything but the mobile application will be powered by a 5V power supply. The mobile application will be downloaded on an android device. The RGB LEDs will have built-in resistors and be connected to the tactile button switches.

When the device has power, it will wait for input from the mobile application to the Bluetooth module that will send this data to the development board in order to know what instructions to run. The user will then follow the instructions given on the mobile application and use the tactile button switches to send signals to the development board according to the LEDs.
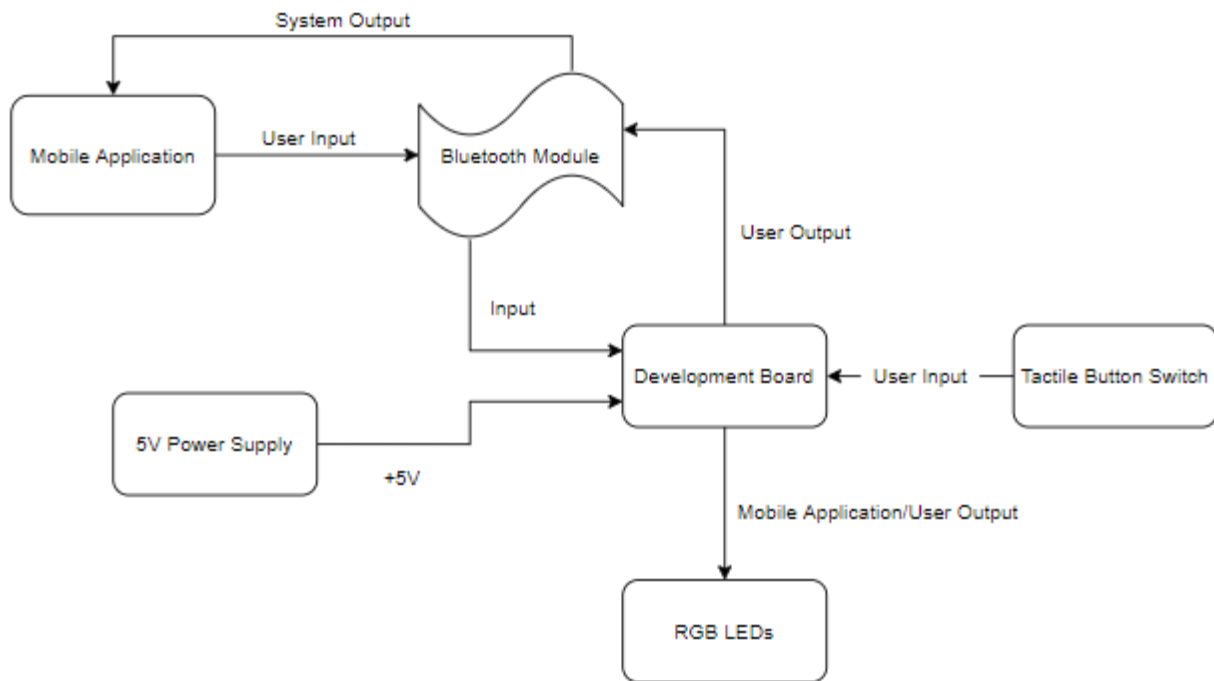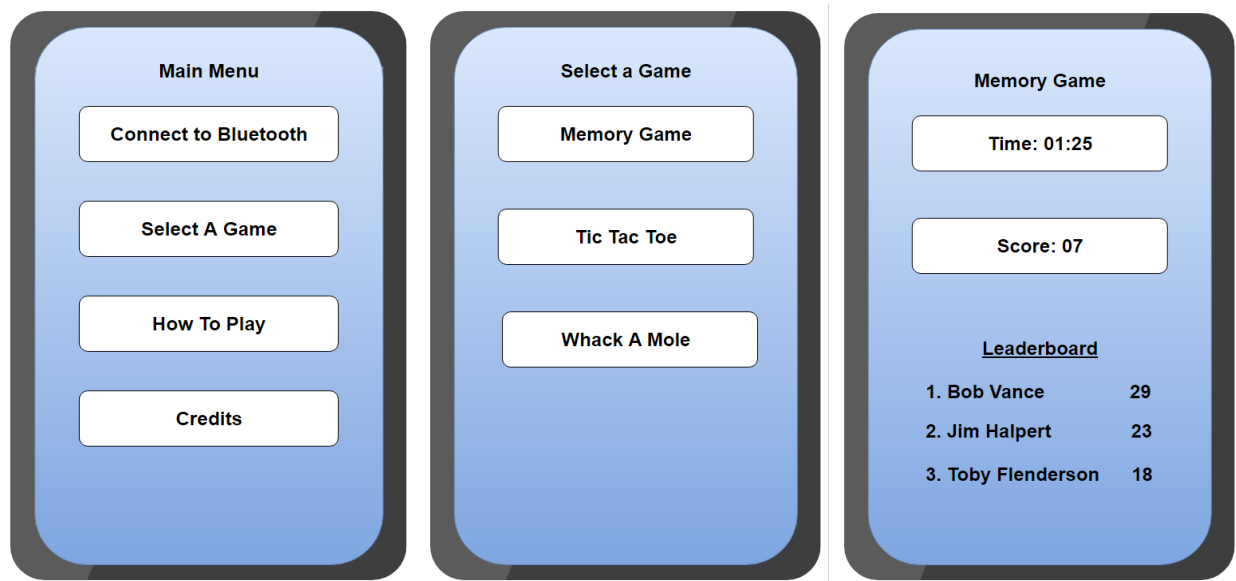
Specification of the Blocks:

This block diagram contains 6 blocks which consist of different hardware and software components that make up the whole system. The component that the user is responsible for is the mobile application which they will have to make sure they download.

Mobile Application:

The Mobile Application block has two functions. It takes in the system output from the Bluetooth module and displays either the user output that has been sent from the development board or the user input from the mobile application. It also converts user input and sends it to the Bluetooth module. The data will then be transferred to the development board where it will tell the RGB LEDs what operation they need to perform.

The Mobile Application will be created into an Android APK and installed onto an android device using the web application for visual programming MIT App Inventor as the operating environment. MIT App Inventor recommends the latest version of Windows 10 or 11 for use and the latest version of Android 11 or 12 for installation.

Acceptance testing begins with the home screen. Testing will check to see if all functions operate as expected. The User will have options to connect to the device via Bluetooth and select a game. The Output of this block will correspond to the data being displayed on the RGB LEDs. Connecting to the bluetooth module and switching between games should all be smooth and intuitive. During games, the input from the tactical button switch will be sent to the development board, to the wifi card, and back to the mobile application which will update and deliver a live feed of the score from the game that is currently being played.

Main Menu	Select a Game	Memory Game
Connect to Bluetooth	Memory Game	Time: 01:25
Select A Game	Tic Tac Toe	Score: 07
How To Play	Whack A Mole	**Leaderboard**
Credits		1. Bob Vance 29
		2. Jim Halpert 23
		3. Toby Flenderson 18

Bluetooth Module:

The Bluetooth Module block consists of the bluetooth module HC-05 which is an extension of the development board. This will be used to connect the mobile application to the device. This module has 2 methods of communication and can be used with most microcontrollers. This is because the module operates Serial Port Protocol, also known as SSP. It is compatible with any microcontroller that supports USART (Universal Synchronous/Asynchronous Receiver/Transmitter) which has a baud rate of 9600. The module is able to operate in two modes which are Data mode, pin set as "LOW", and AT command mode, pin set as "HIGH", but in this instance we will use it in Data mode. The module is connected through the Rx and Tx pins and has a range of about 100m.
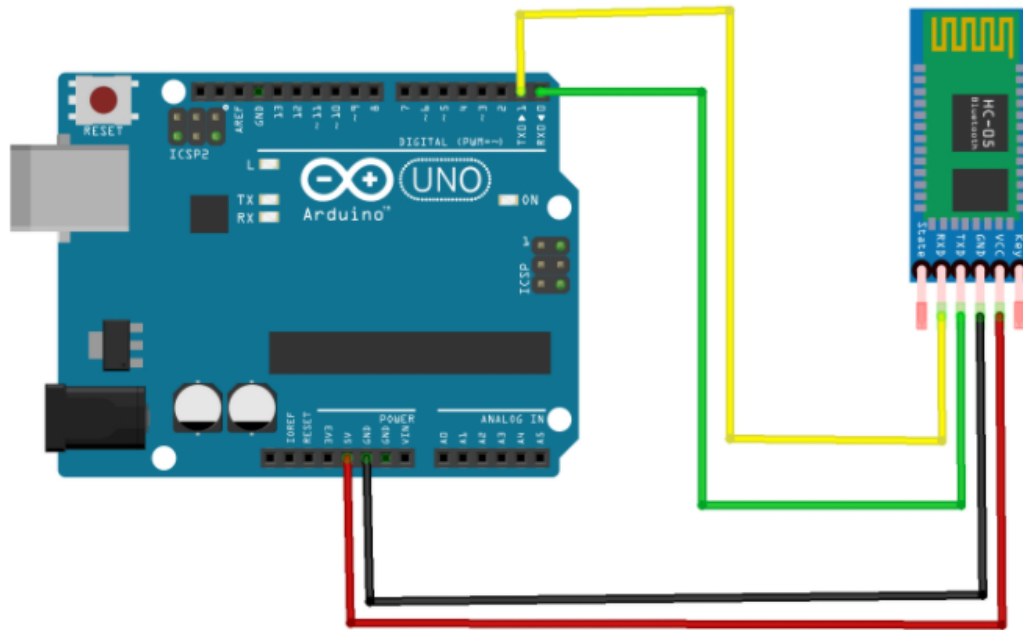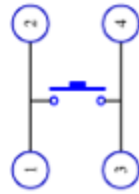
Development Board:

This development board is the component that links all others and the hub for transmitting signals and voltage in and out of all other components. The development board will take inputs from the bluetooth module and the tactile button switches and output them to the mobile application and LEDs. As it reads the inputs from the mobile application it knows what instructions to follow for each game mode.

5V Power Supply:

The 5V power supply will power the development board, bluetooth module, and RGB LEDs. Luckily all components can be powered through this power supply without having to convert the value.

Tactile Button Switch:

The tactile button switch will take the user input and direct it to the development board. It will be used to play the games by using momentary action. The switch will take the users' manual input for each game and create an input signal that will go to the development board allowing it to keep track of the users' gameplay and their scores. As the tactile buttons are selected correctly the development board will update the mobile application and LEDs accordingly.

RGB LEDs:

Depending on the user's input of game selection, the development board will follow certain instructions and light up the LEDs as programmed. For the Whack a mole and memory game the LEDs will indicate what buttons the user must push. As for tic tac toe, the LEDs will indicate the selections made by the user and the "computer" they will play against. They consist of four pins led out, three of which are for the primary colors red, blue and green, and a ground. The LEDs should update as the tactile buttons are selected correctly such as turning off, starting a new sequence or light up based on the game being played.

DIP Package