

GAMING WIZARD

A SMART TABLETOP GAMING SYSTEM



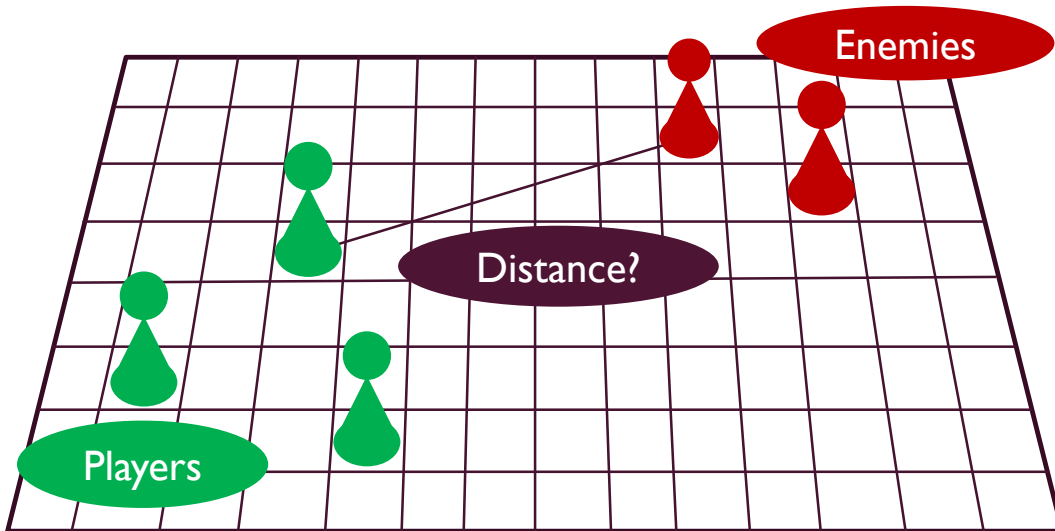
Group 30

- Gabriel Holguin - Computer Engineering
- Daniel Kalley - Computer Engineering
- Erica Lindbeck - Electrical Engineering
- Logan Taylor - Electrical Engineering

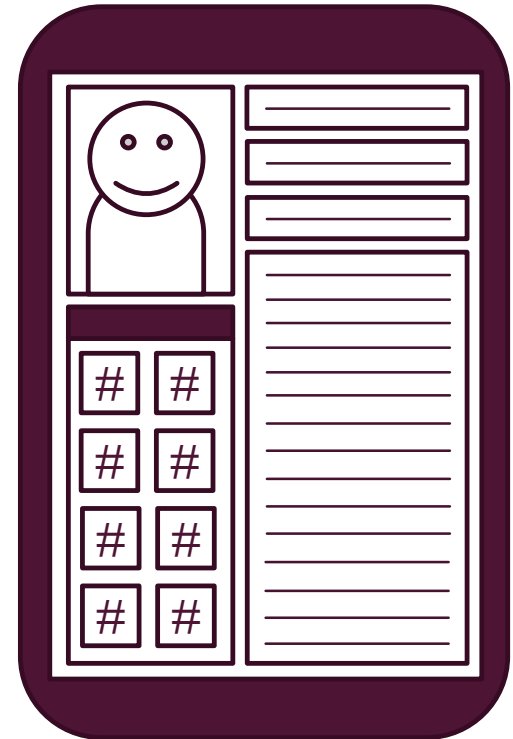
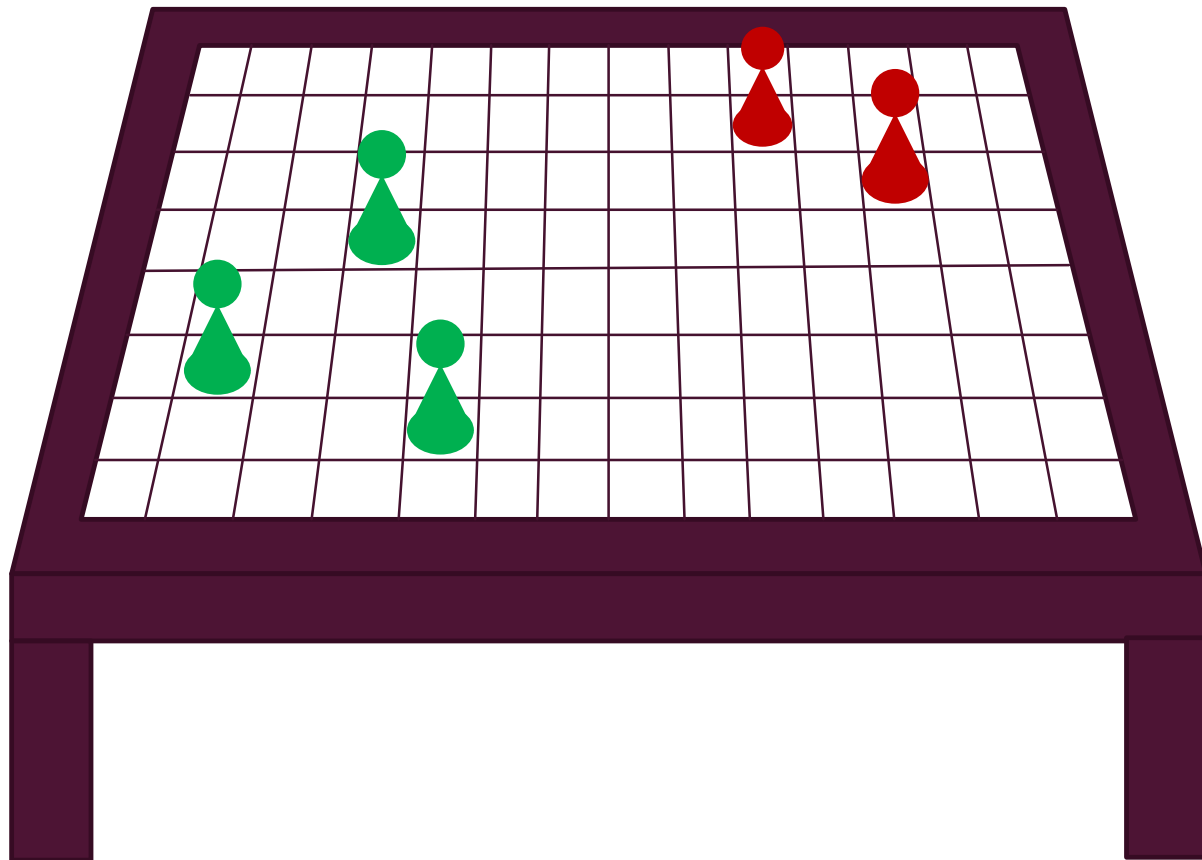
MOTIVATION



- Tabletop roleplaying games are experiencing a resurgence in popularity
- Time is wasted in setup, information lookup, and calculations
- Keeping track of abilities can be complex and confusing



PROPOSED SOLUTION



ENGINEERING REQUIREMENTS



Requirement	Value
Screen Size	20''-36'' per side
Table Height	$\leq 3'6''$
Display Resolution	≥ 720 px / side
Object Size for Detection	$\geq 0.5''$ diameter
Operating Temperature Inside Table	≤ 32 °C
Time to Cool on Start	≤ 15 minutes
Continuous Operation	≥ 6 hours
Device Lifetime	≥ 3 years
People Required to Move Table	≤ 2

Requirement	Value
Simultaneous Touch Inputs	≥ 6
Touch Input Delay	≤ 200 ms
Simultaneous Mobile Controllers	≥ 5
Mobile Controller Input Delay	≤ 1000 ms
Mobile Controller Range	$\geq 10'$
Object Location Accuracy	$\pm 0.5''$
Locations Saved on Exit	≥ 20
Average Time to Set Up Map	≤ 2 minutes
Characters Saved in App	≥ 4

OTHER CONSTRAINTS



Ethical Concerns

- No data is being stored in online servers, since all game and app data is stored locally on a PC and Android device respectively

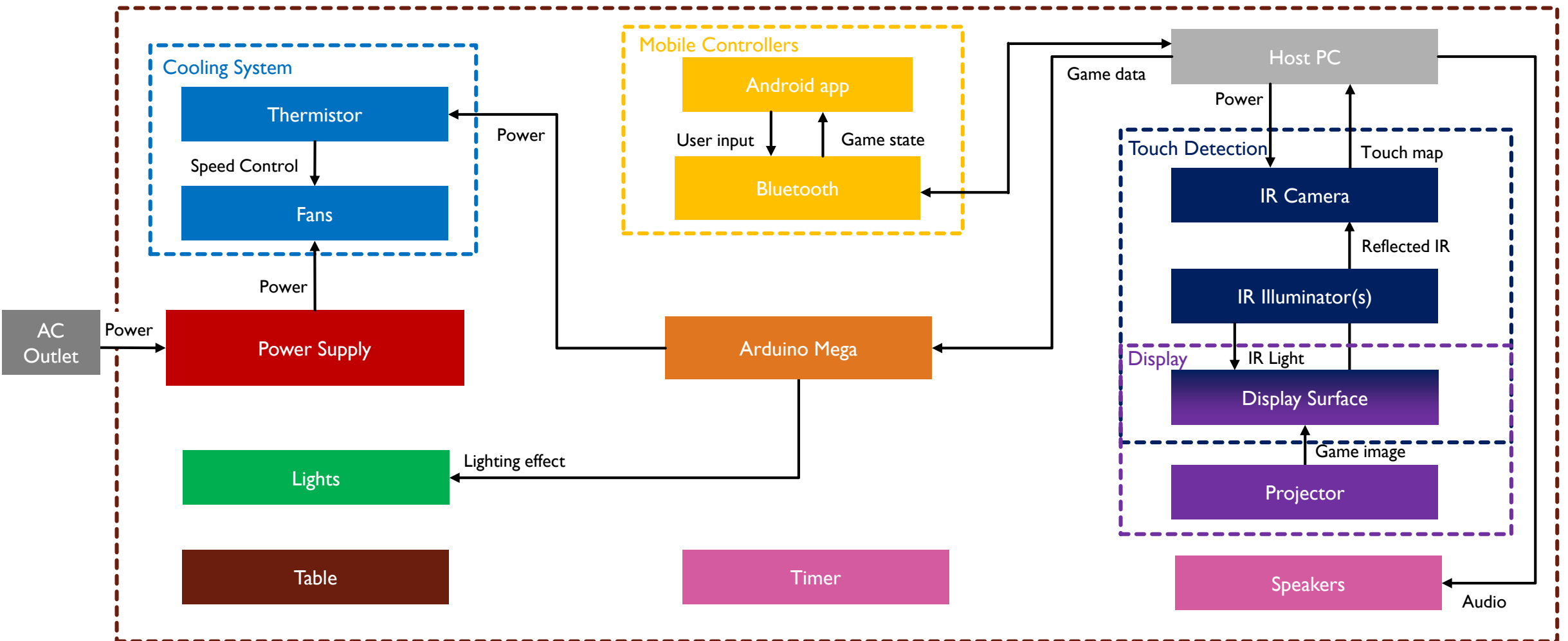
Social Considerations

- Viability of potential users, since product is currently costly and only supports Android OS
- Need to make sure not to infringe on copyright, especially on game material

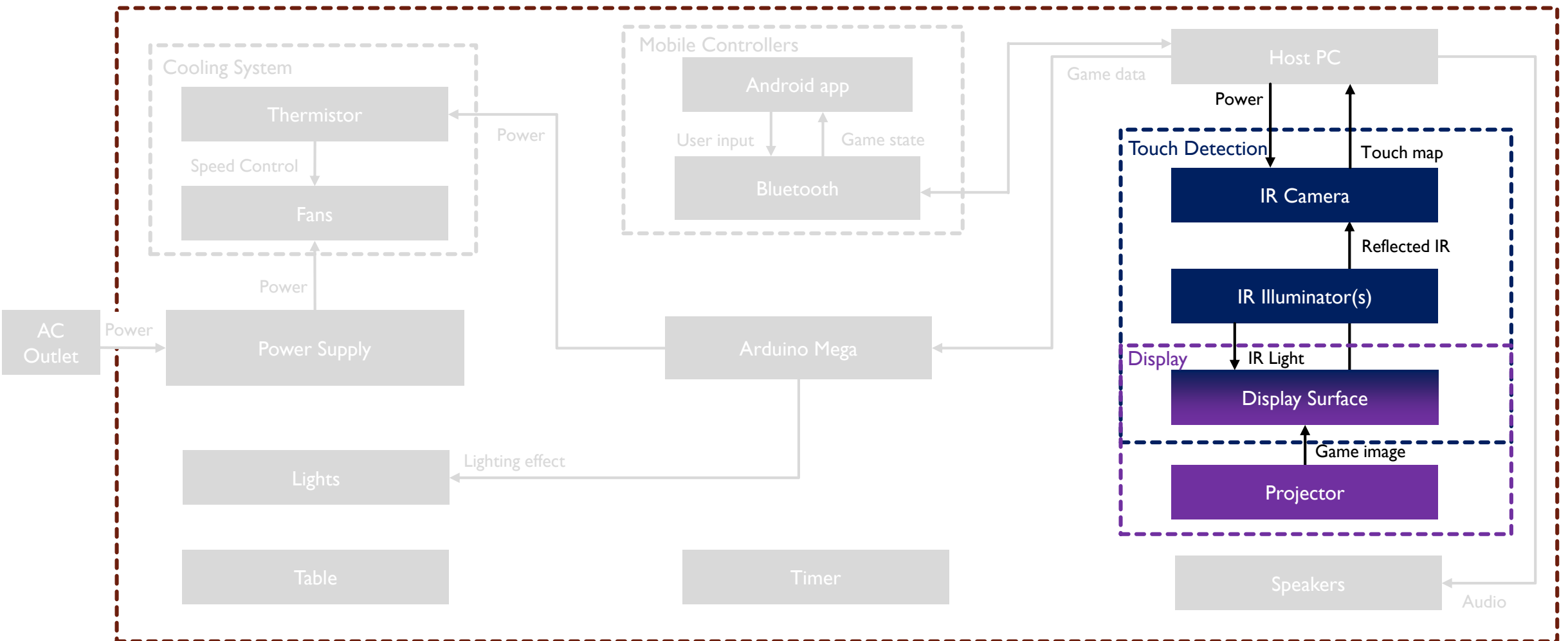
Electronic Safety

- Soldering should be done with a clear head and proper safety equipment on hand.
- Electronics should be in an enclosed environment so users can't injure themselves with wires and circuit boards
- Projector should always be off when in movement
- Volume and light limits for what players deal with

FINAL SOLUTION – HARDWARE



HARDWARE – TOUCHSCREEN



TOUCHSCREEN - METHODS

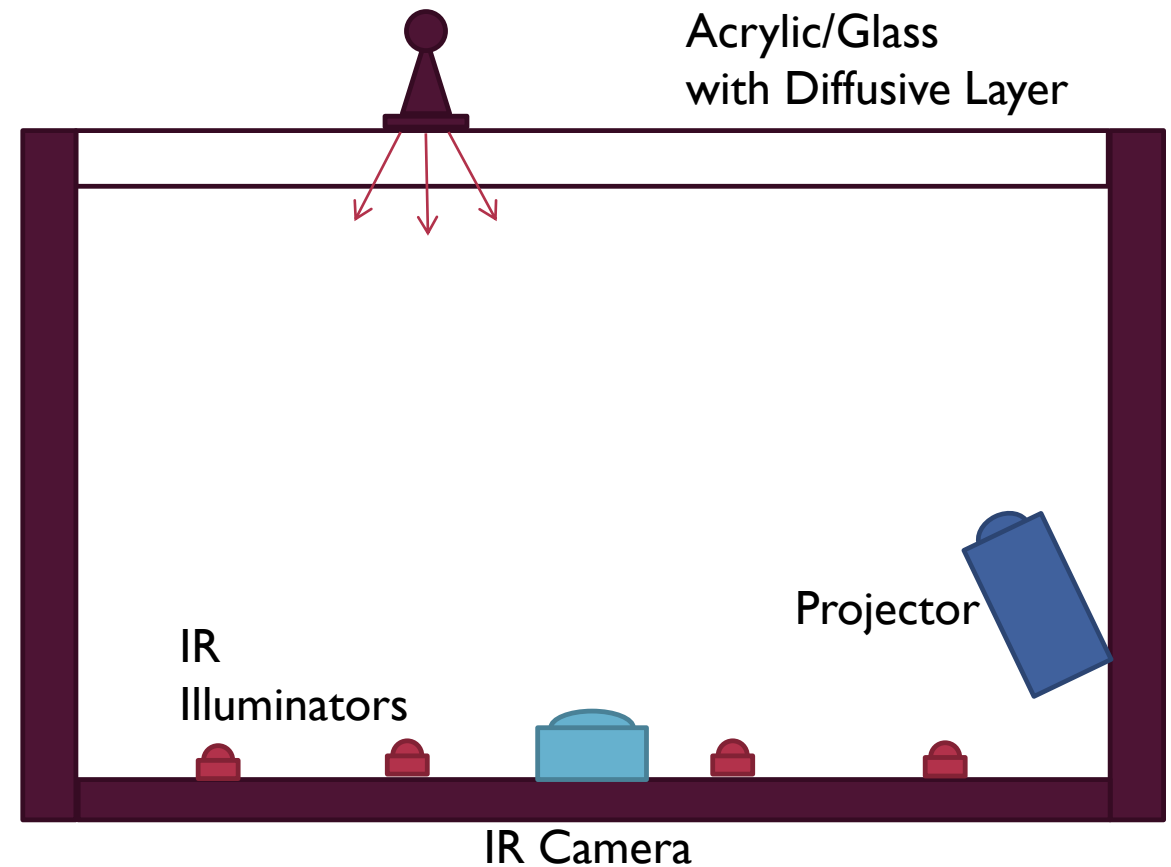


Requirements

- Distinguish locations on 1" square grid
- Detect objects as well as users' fingers
- ≥ 24 " per side

Rear Diffused Illumination (Rear DI)

- Advantages: No limit on simultaneous touches, inaccuracy due to camera resolution is small, difficult to illuminate evenly, IR illuminators restrict space for other components
- Disadvantages: Closed box and projector required, difficult to scale



TOUCHSCREEN - COMPONENTS



Projector – Used BenQ MX810ST

- 1024 x 768 Native Resolution (4:3 Aspect Ratio)
- 0.6 Throw Ratio
(20" throw distance required for 24" x 32" display)
- 2500 ANSI Lumens
- 4600:1 Contrast Ratio
- 3500 – 5000 hour lamp life (> 1500 remaining)
- Remote and USB control options
- Auto and Manual Vertical Keystoning up to $\pm 30^\circ$

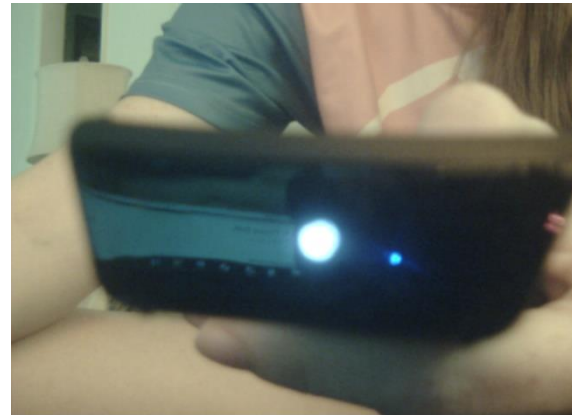


TOUCHSCREEN - COMPONENTS



Camera – PlayStation Eye + Floppy Disk

- 640 x 480
- 60 fps
- USB 2.0 connection
- PC driver available for \$3
- Explicitly supported by existing open-source touch detection software
- Removable infrared-blocking filter
- Floppy disk material can be used as cheap visible light-blocking filter



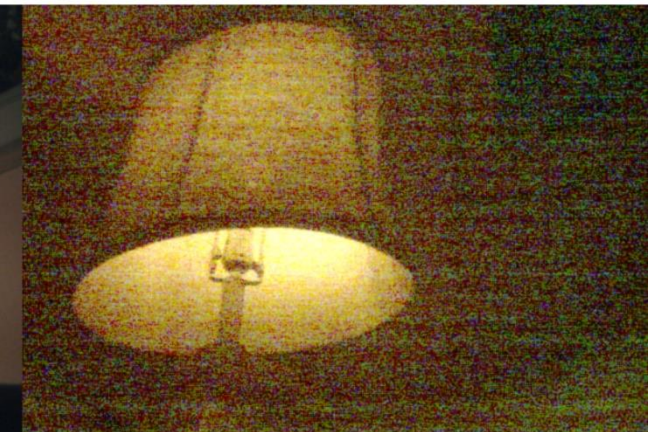
(a) Infrared Source Before Filtering



(b) Infrared Source After Filtering



(c) Incandescent Light Before Filtering



(d) Incandescent Light After Filtering

TOUCHSCREEN - COMPONENTS



Screen Materials

- Cast Acrylic
 - 24" X 32" X 0.25"
 - (25.5" X 33.375" X 0.25" after completion of table)
 - Chosen for strength and rigidity
- Drafting Film
 - 0.005" thick
 - Chosen for cost, ease of modification, and durability
 - Trade-off between blob contrast and image visibility

Illumination

- Tendelux 80 ft IR Illuminator (x2)
 - 850 nm wavelength
 - Intended for use with night vision security cameras
 - Comes with power supply and mounting mechanism
 - Designed to eliminate hot spots

HARDWARE - TABLE

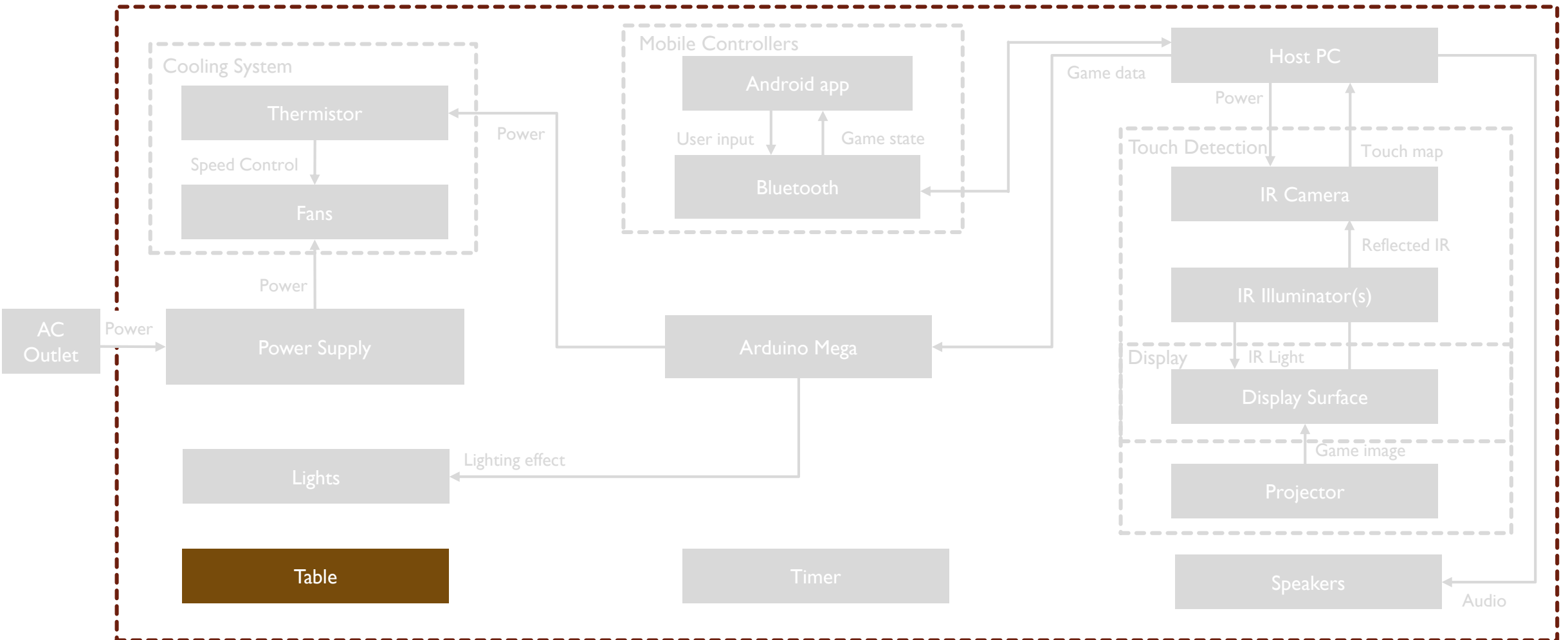


TABLE DESIGN

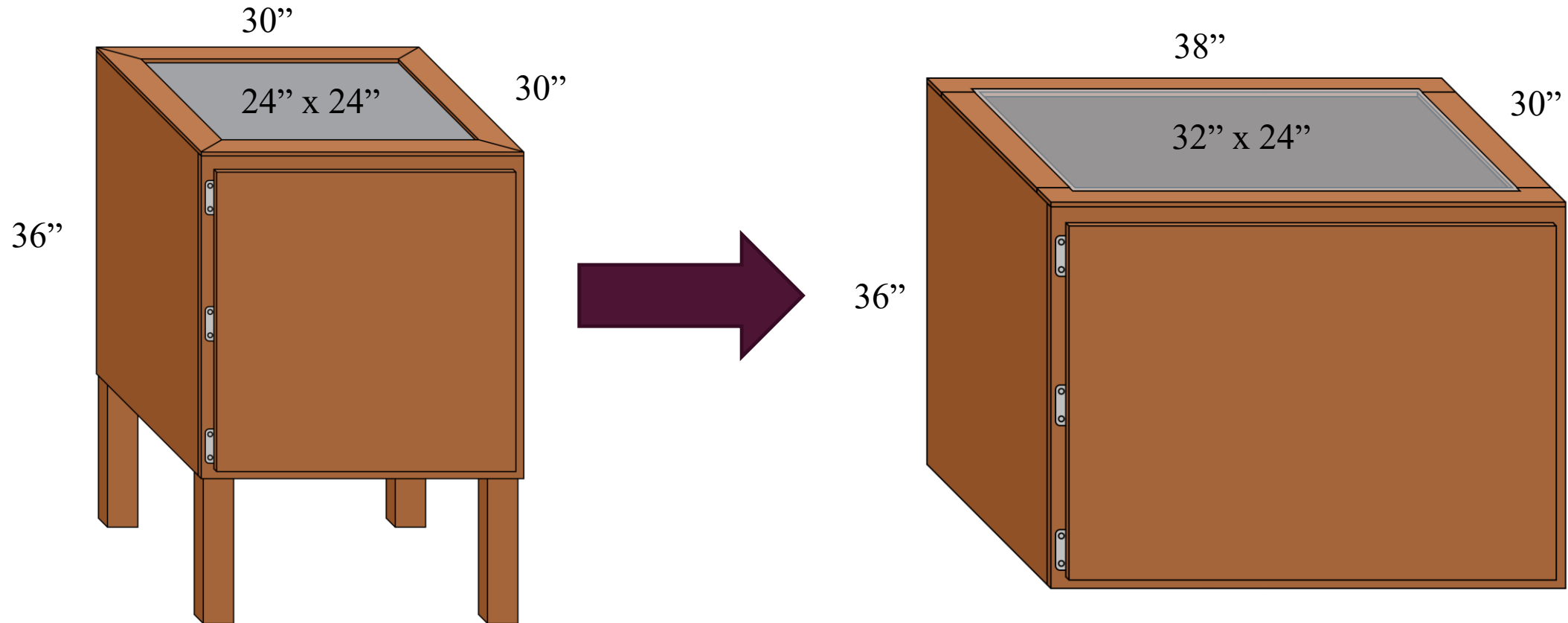
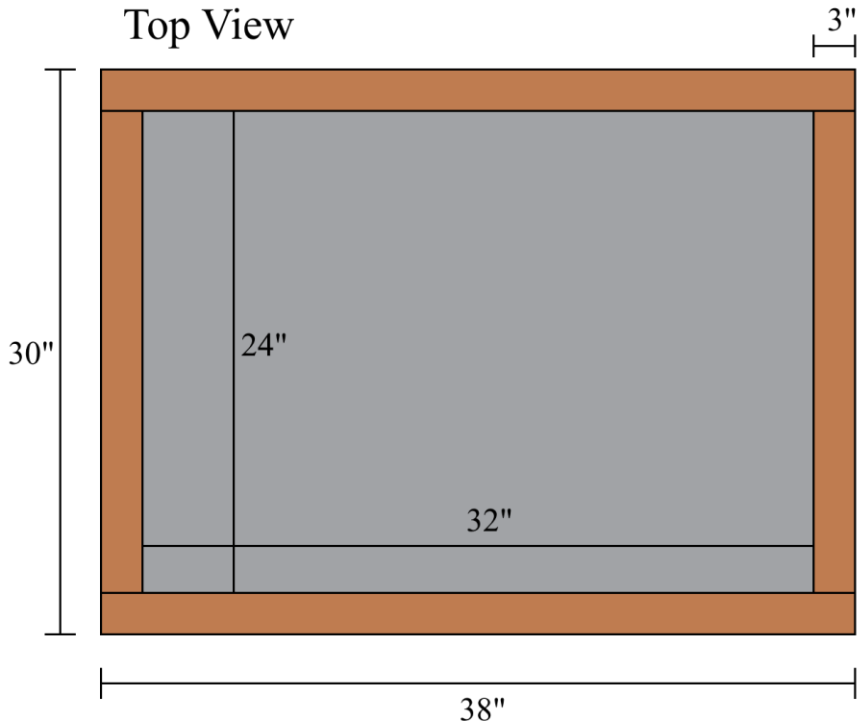


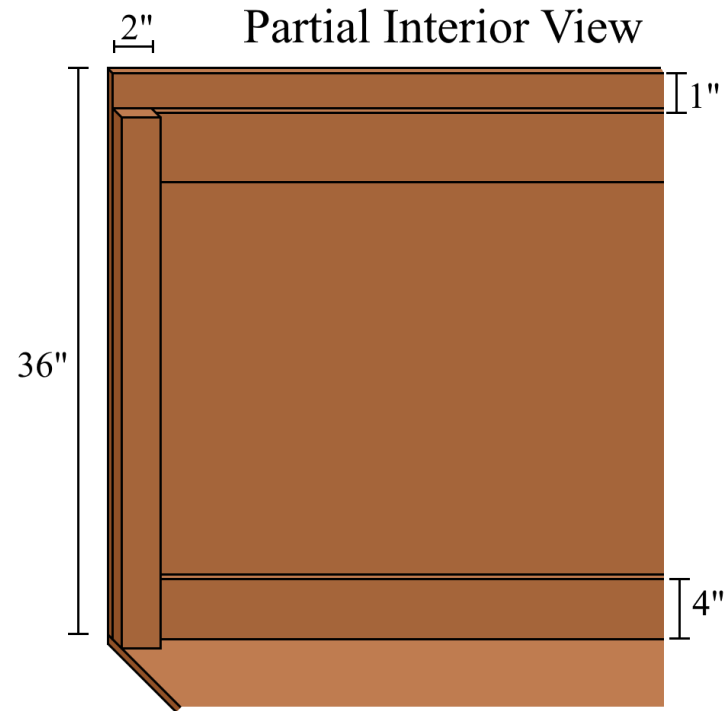
TABLE DESIGN



Top View



Partial Interior View



Front Door View

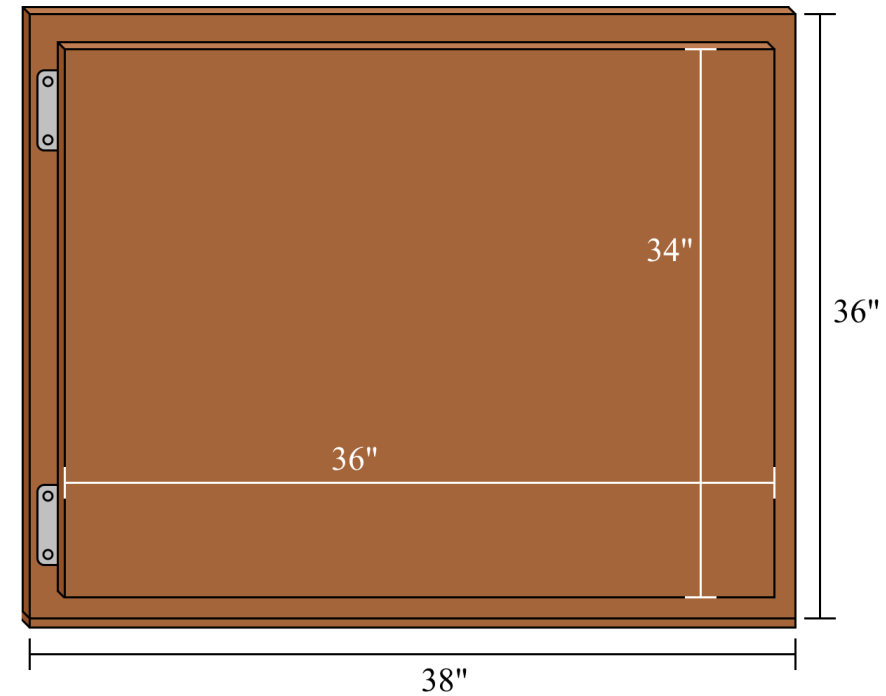
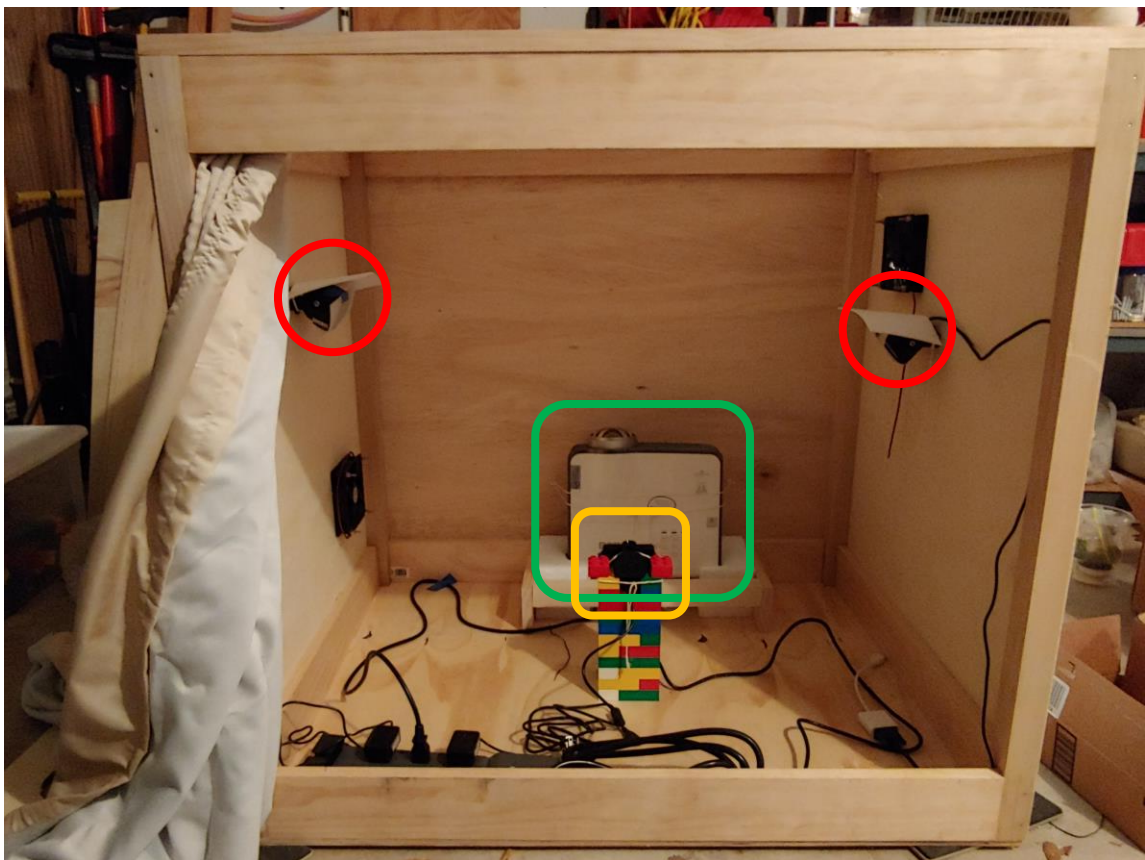
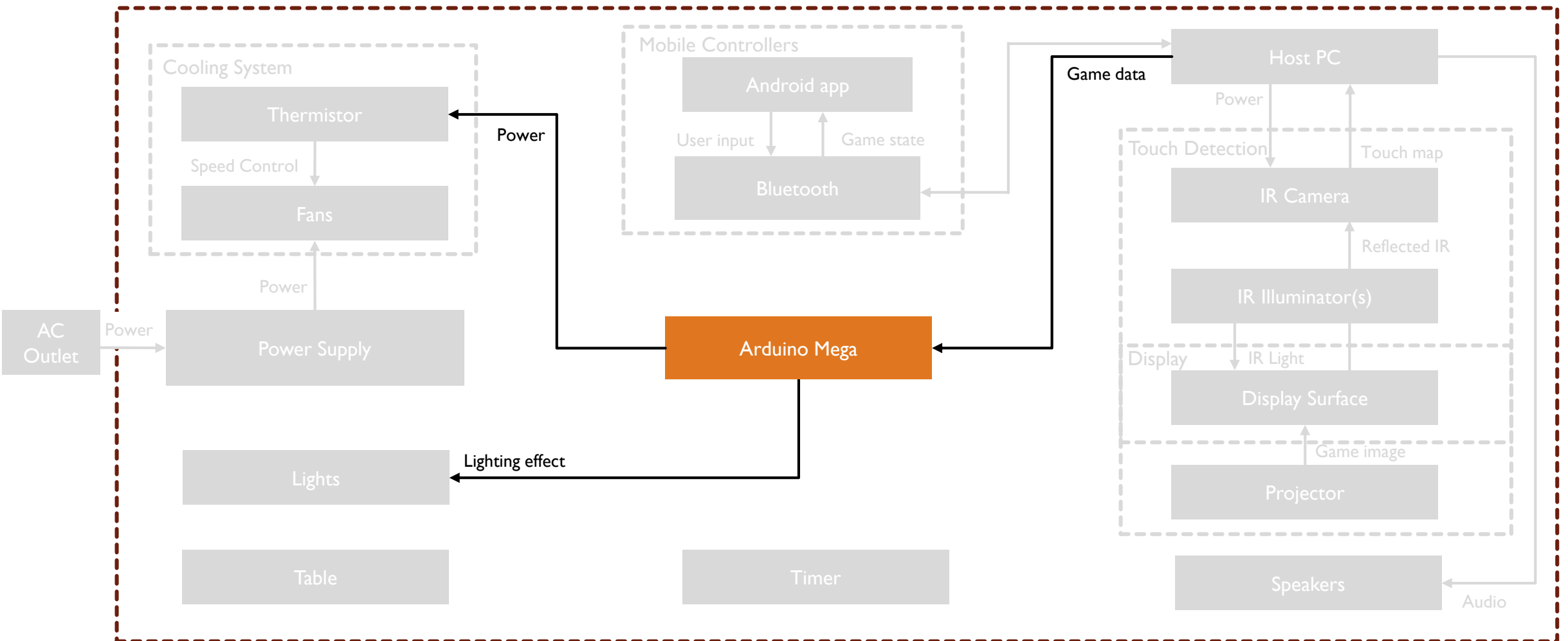


TABLE AND TOUCH SCREEN SETUP



- Infrared illuminators
- Projector
- Camera

HARDWARE - MICROCONTROLLER



MCU – MCU SELECTION



Requirements

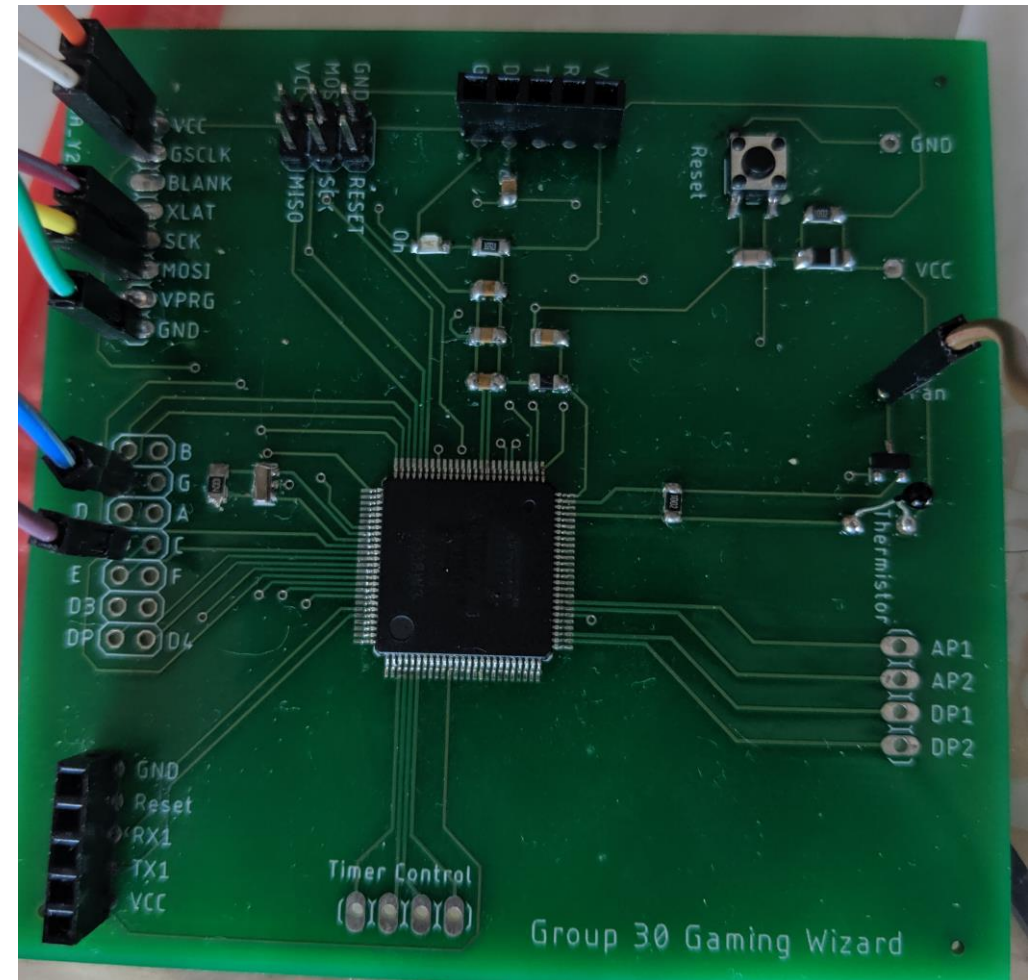
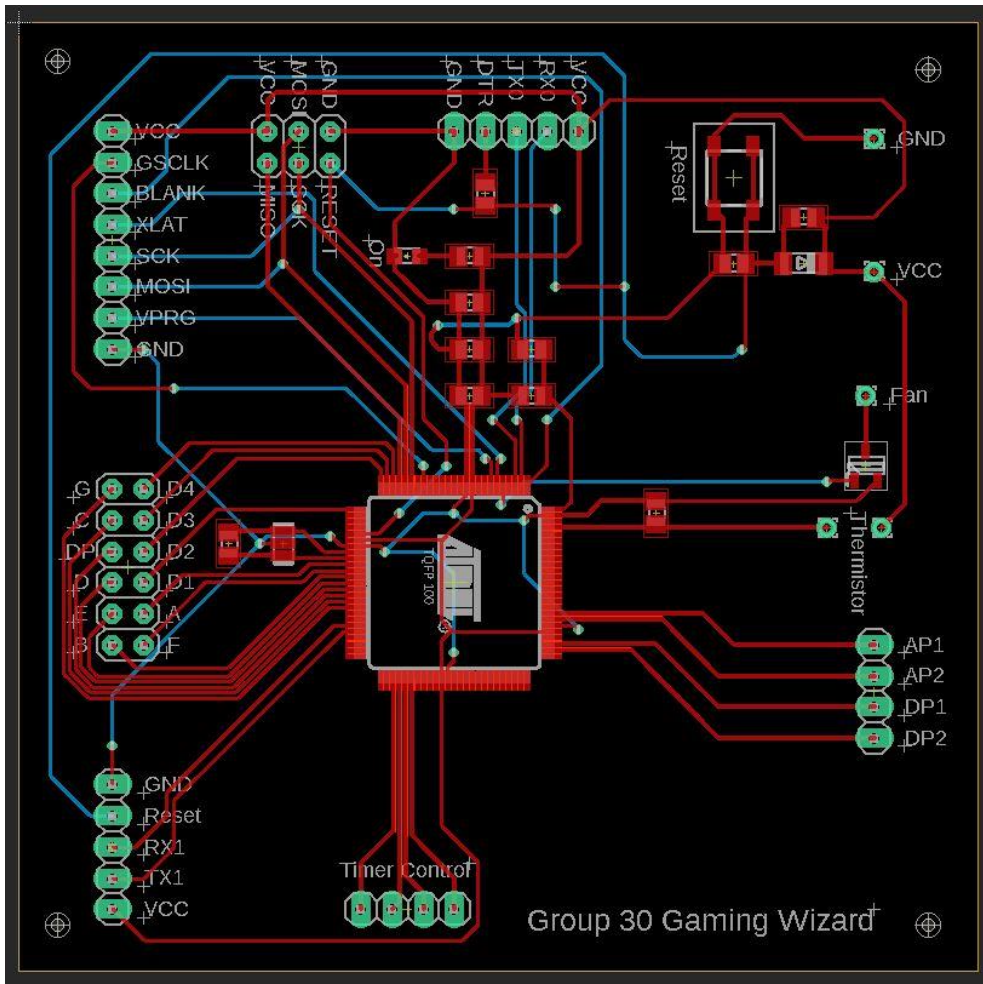
- Enough I/O lines for timer, LED drivers, temperature sensor and communication.
- Enough memory for bootloader and software.

Desired

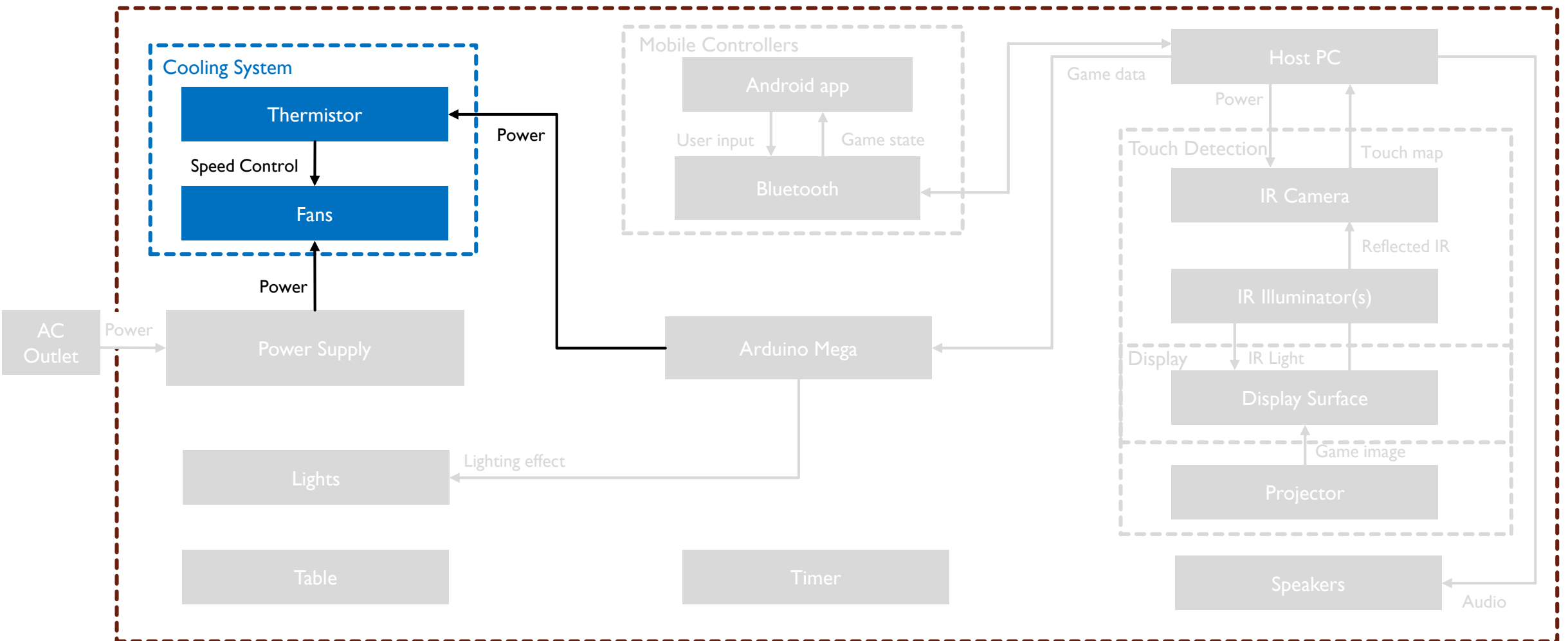
- Large amount of documentation
- Familiar
- Affordable

	ATmega328P	MSP430FR6989	ATmega2560
CPU type	8-bit AVR	16-bit ULP	8-bit AVR
Performance	20 MIPS at 20 MHz	16 MIPS at 16 MHz	16 MIPS at 20 MHz
Flash memory	32 KB	128 KB	256 KB
SRAM	2 KB	2 KB	8 KB
EEPROM	1 KB	0 KB	4 KB
Pin count	28	100	100
Maximum operating frequency	20 MHz	16 MHz	20 MHz
Maximum I/O pins	23	83	86
Cost	\$2	\$8	\$12

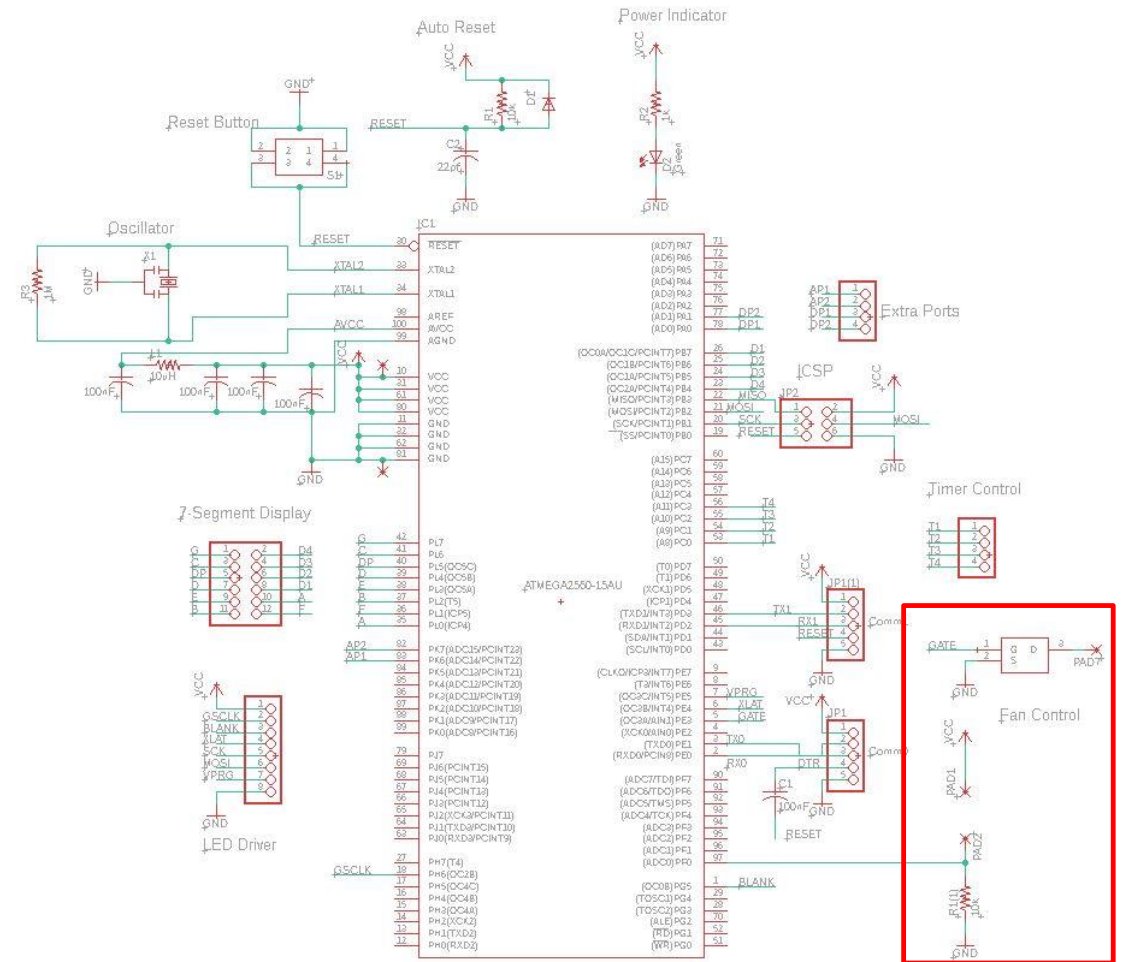
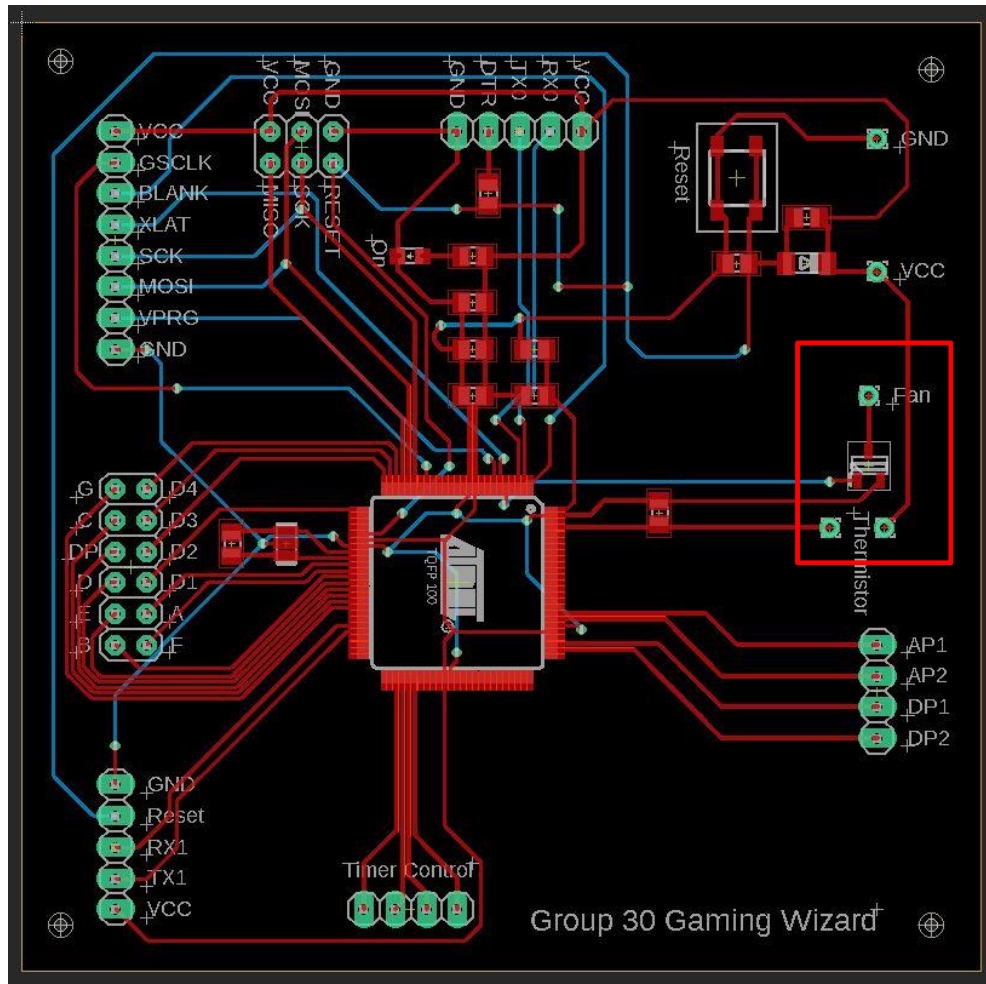
PCB DESIGN – MCU BOARD



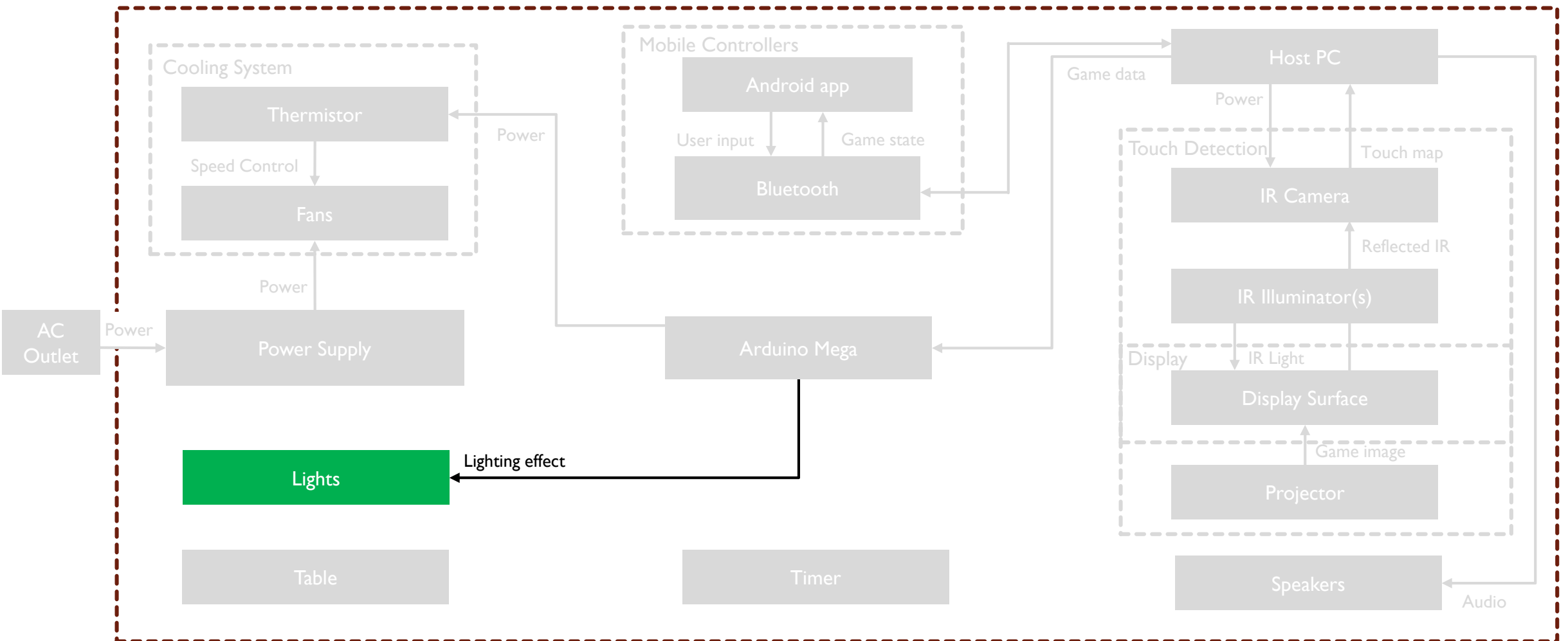
HARDWARE – COOLING SYSTEM



PCB DESIGN – FAN CONTROL



HARDWARE – EFFECT LIGHTING



EFFECT LIGHTNING – LED DRIVER SELECTION

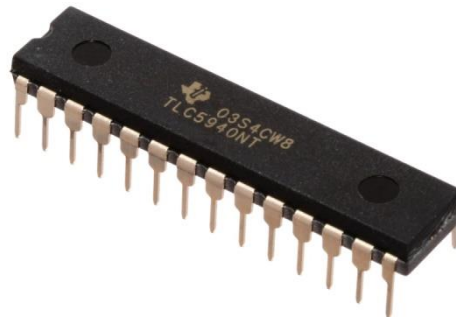


TLC5940 16-channel LED driver

- Advantages: Uses standard SPI interface (can be daisy chained), Larger PWM depth (12 bits vs 8 bits).
- Disadvantages: More complicated to implement. Requires six output lines from MCU.

WS2812b “Neopixel”

- Advantages: Only requires a single data line, Easy to control large amount.
- Disadvantages: Communication protocol not standard and is handled via software “bit banging”.

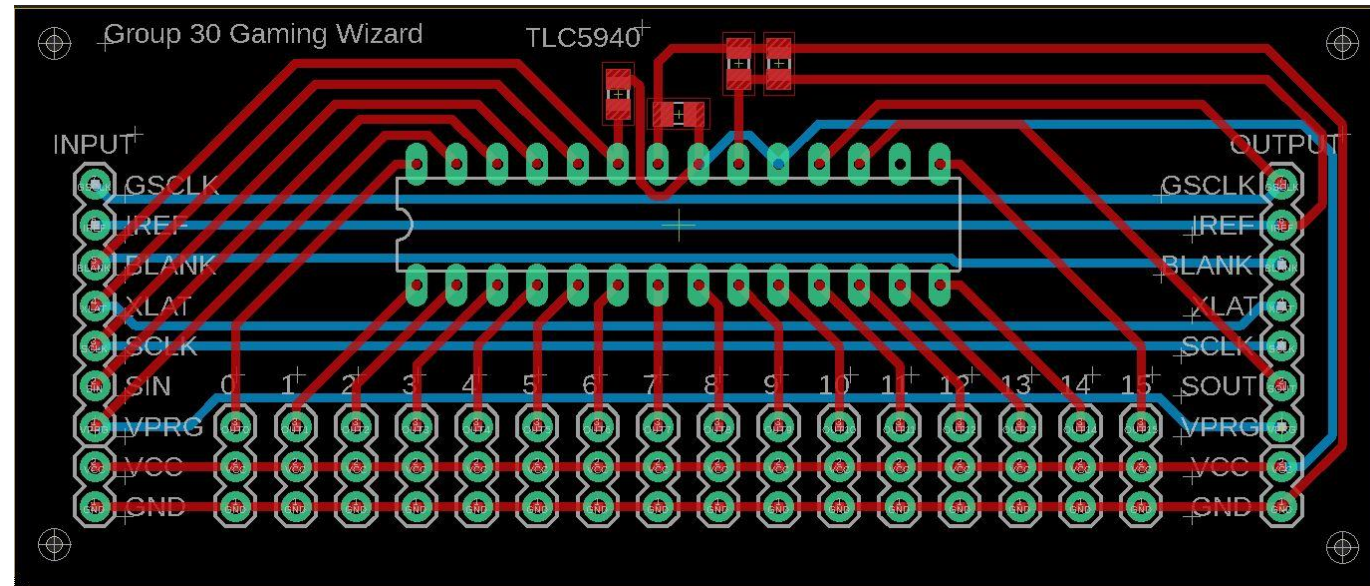
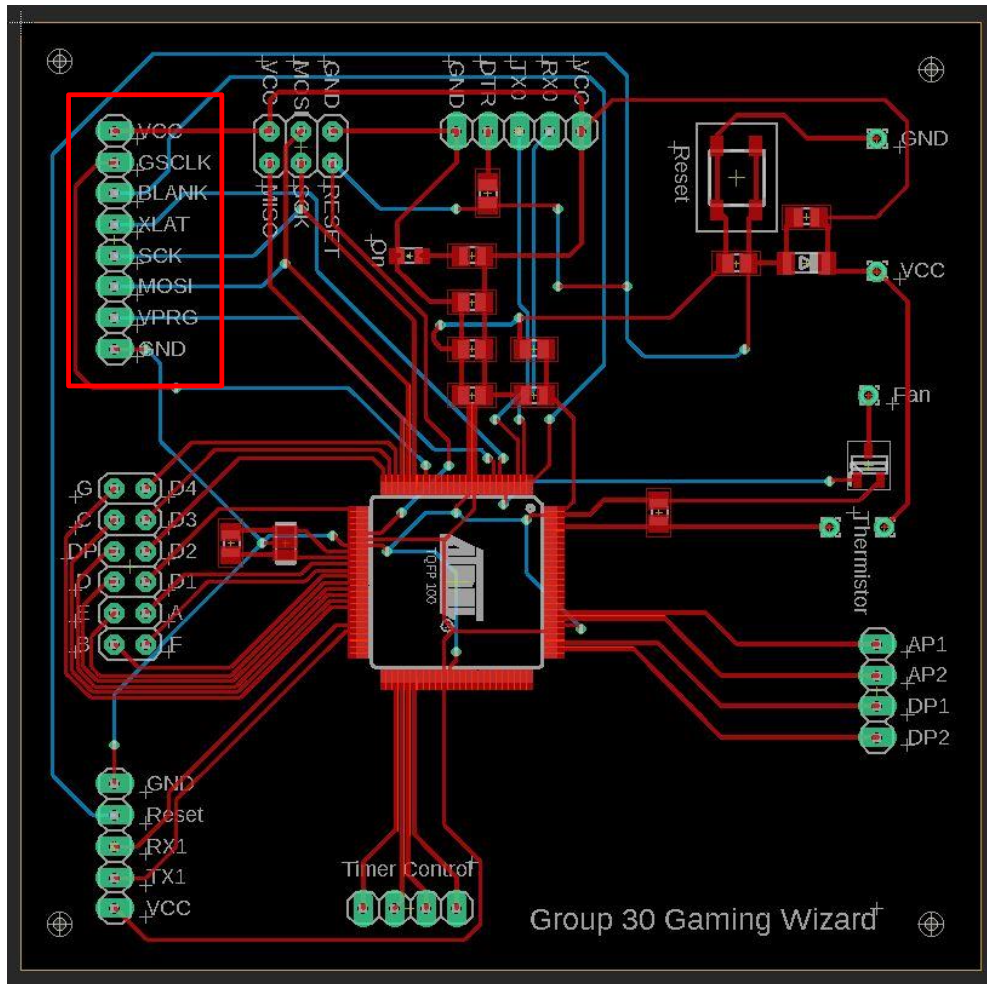


TLC5940

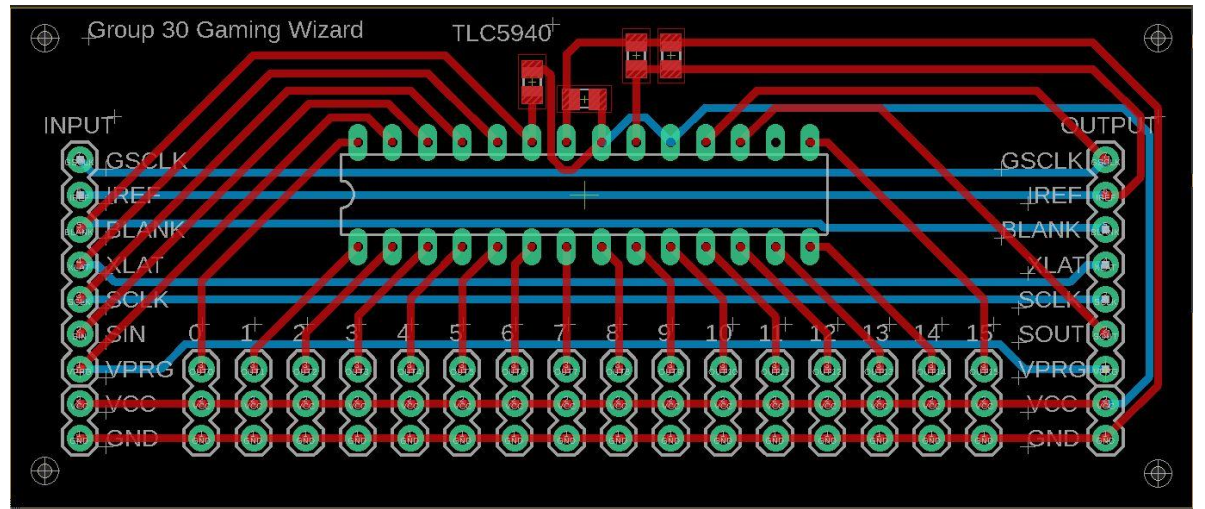
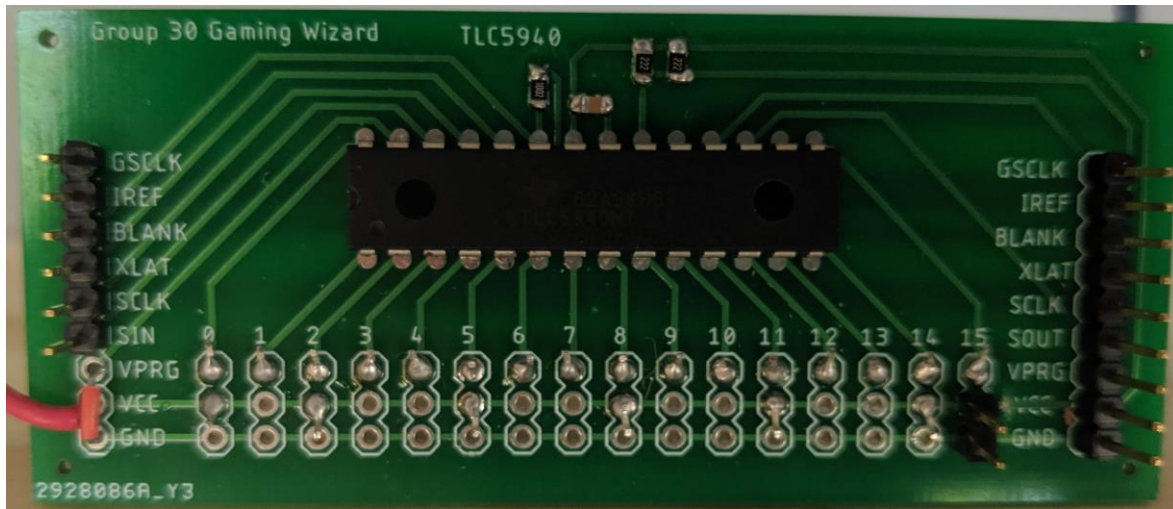


Ws2812b neopixel

PCB DESIGN – LED DRIVER BOARD



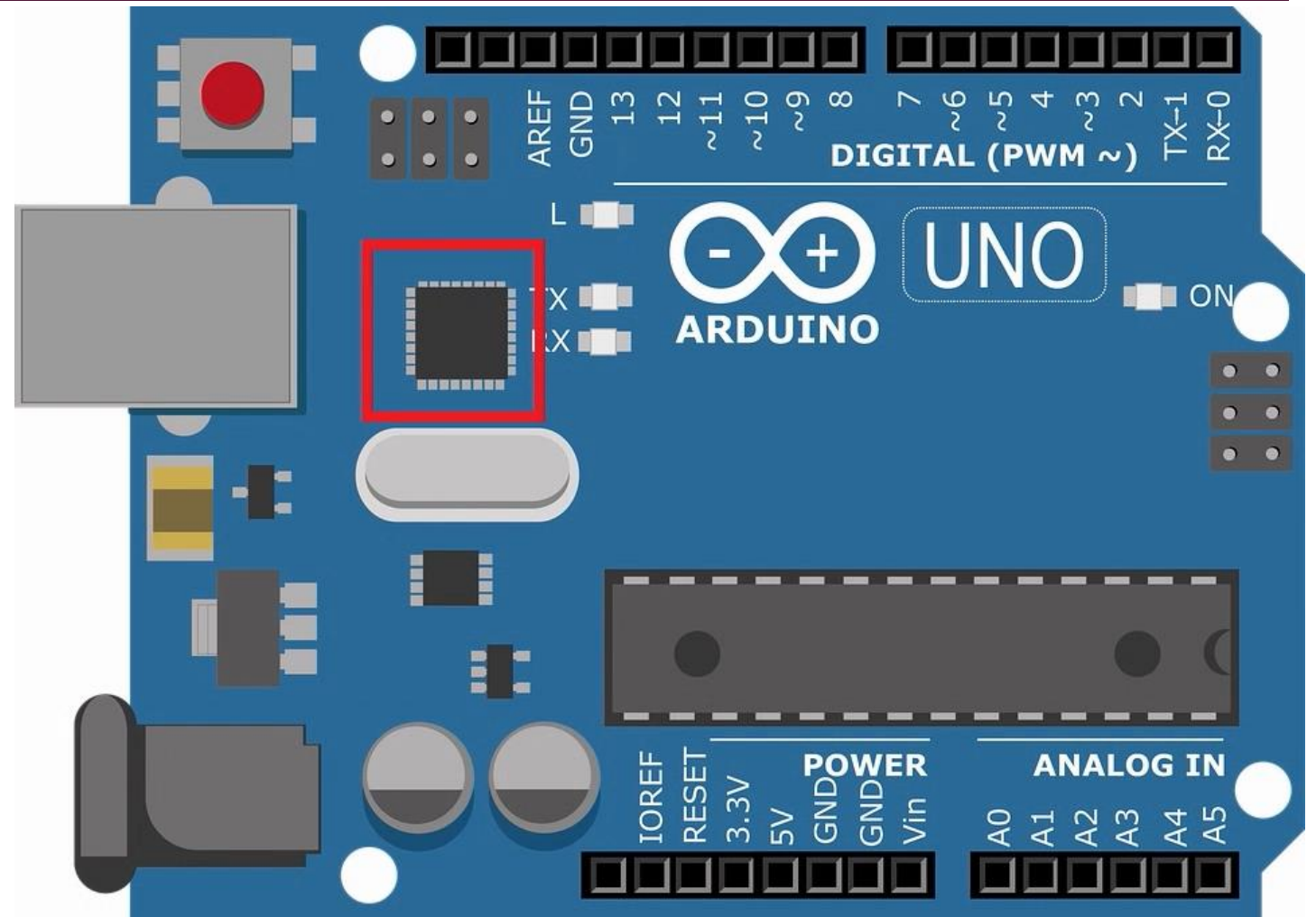
PCB DESIGN – LED DRIVER BOARD



MCU – SERIAL COMMUNICATION

Communicating with the PC

- Signals must be sent from the user's PC to the MCU for controlling LED effects.
- Arduino requires using a second MCU for USB to serial communication.
- This complicates PCB design and requires a second ICSP for programming.

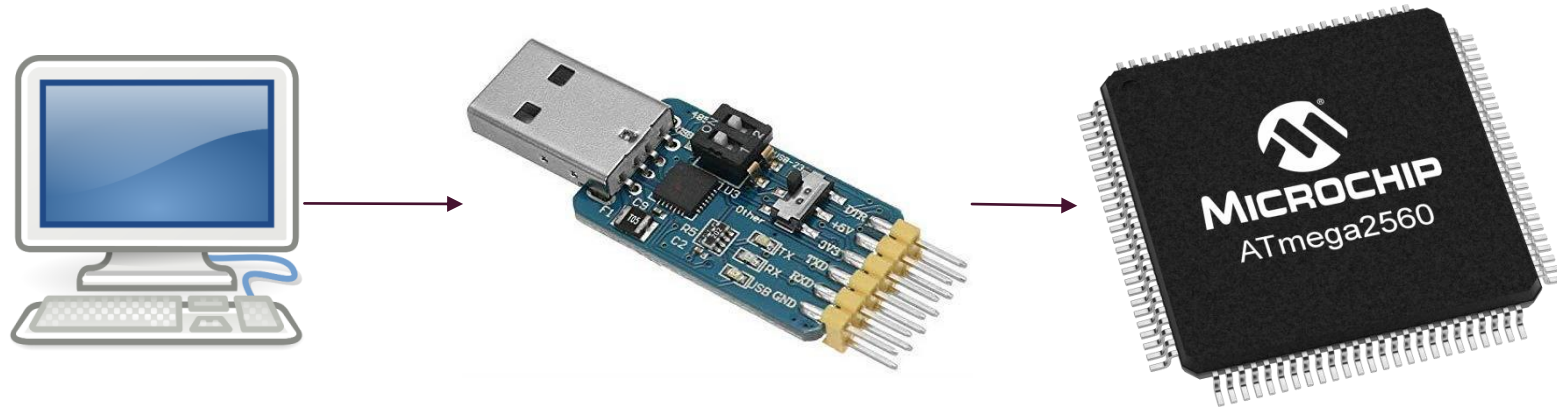


MCU – SERIAL COMMUNICATION

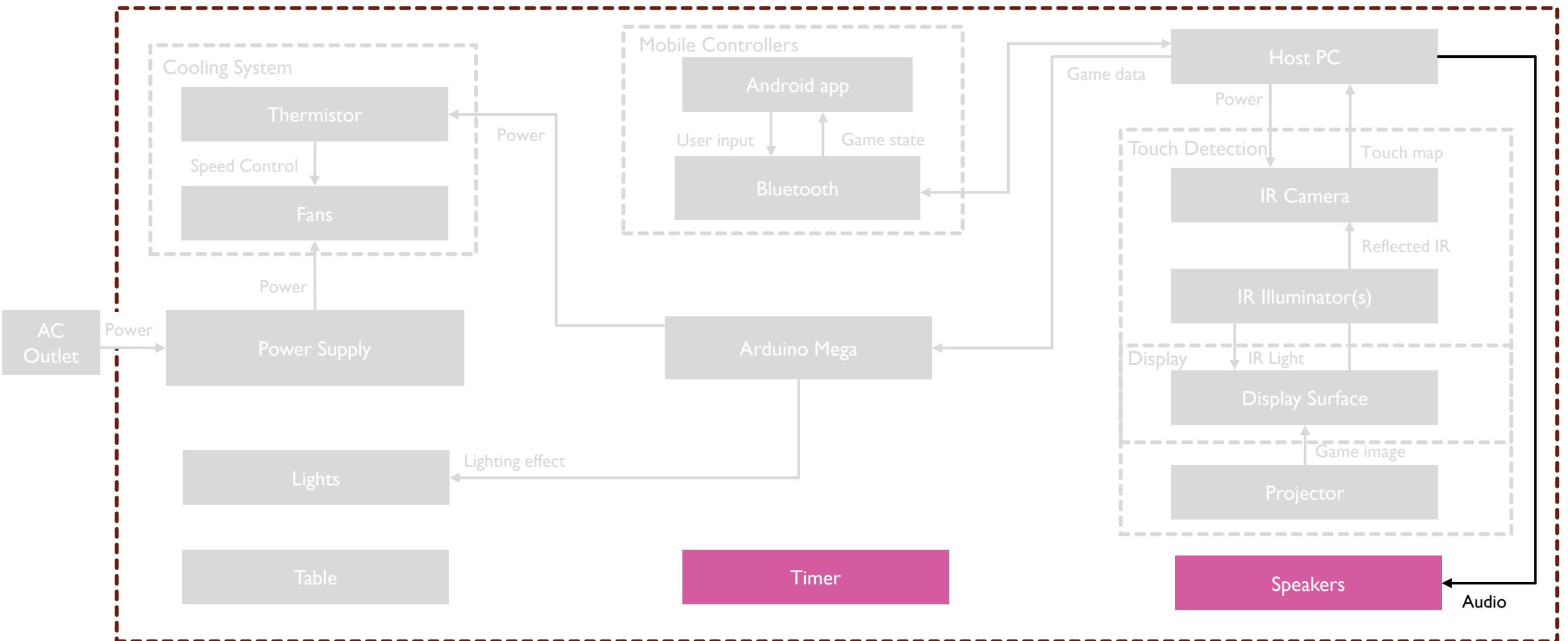


USB to Serial Adapter – FT232RL

- Allows communication with MCU from host PC.
- Allows programming of MCU via USB.
- Simplifies PCB design



HARDWARE – ADDITIONAL FEATURES



ADDITIONAL FEATURES



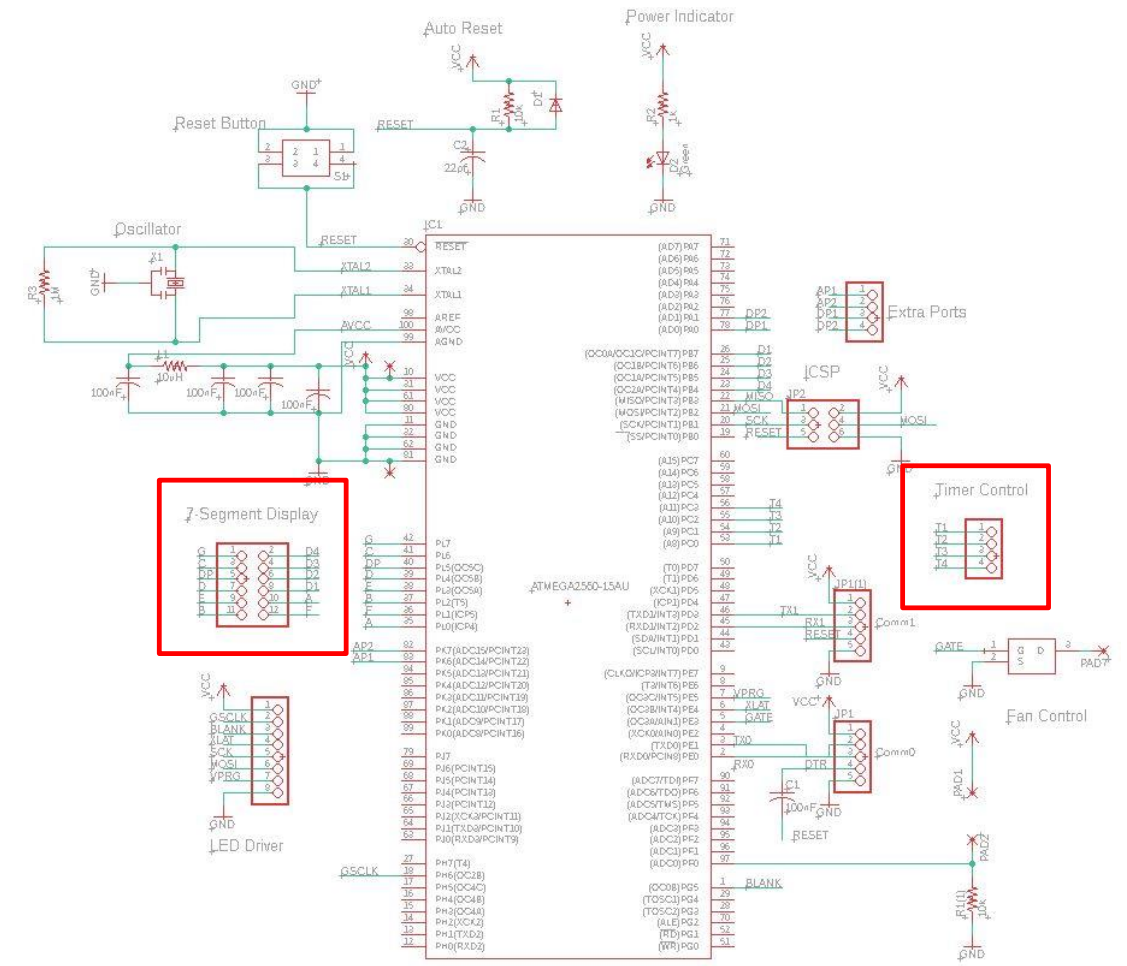
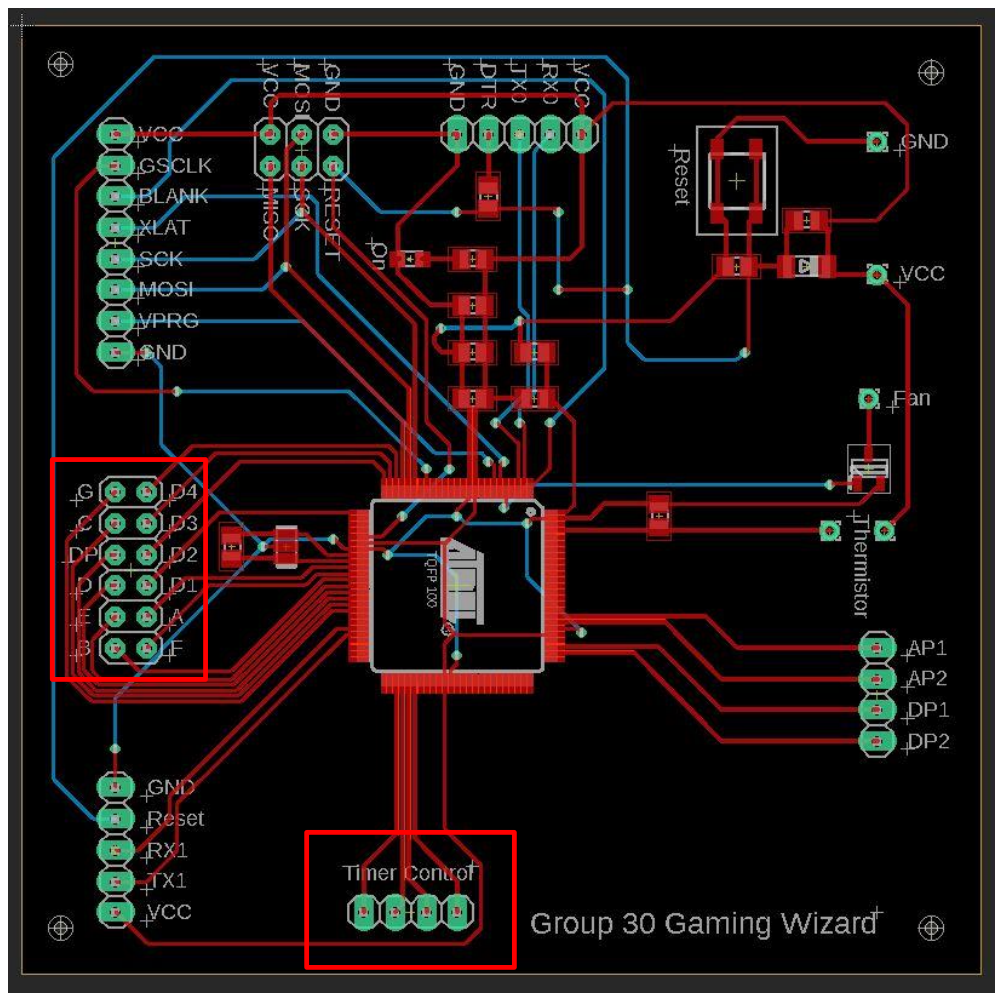
Timer

- Limit time per turn
- Set time-sensitive challenges for players
- Quad 7-Segment LED Display
 - Multiplexing for each digit
 - 16 pins
 - Low power usage (40 mW/segment)
- Start/Stop, +Minute, and +Second Buttons
- 4 States of Operation: Off, On, Running, Complete

Sound Effects

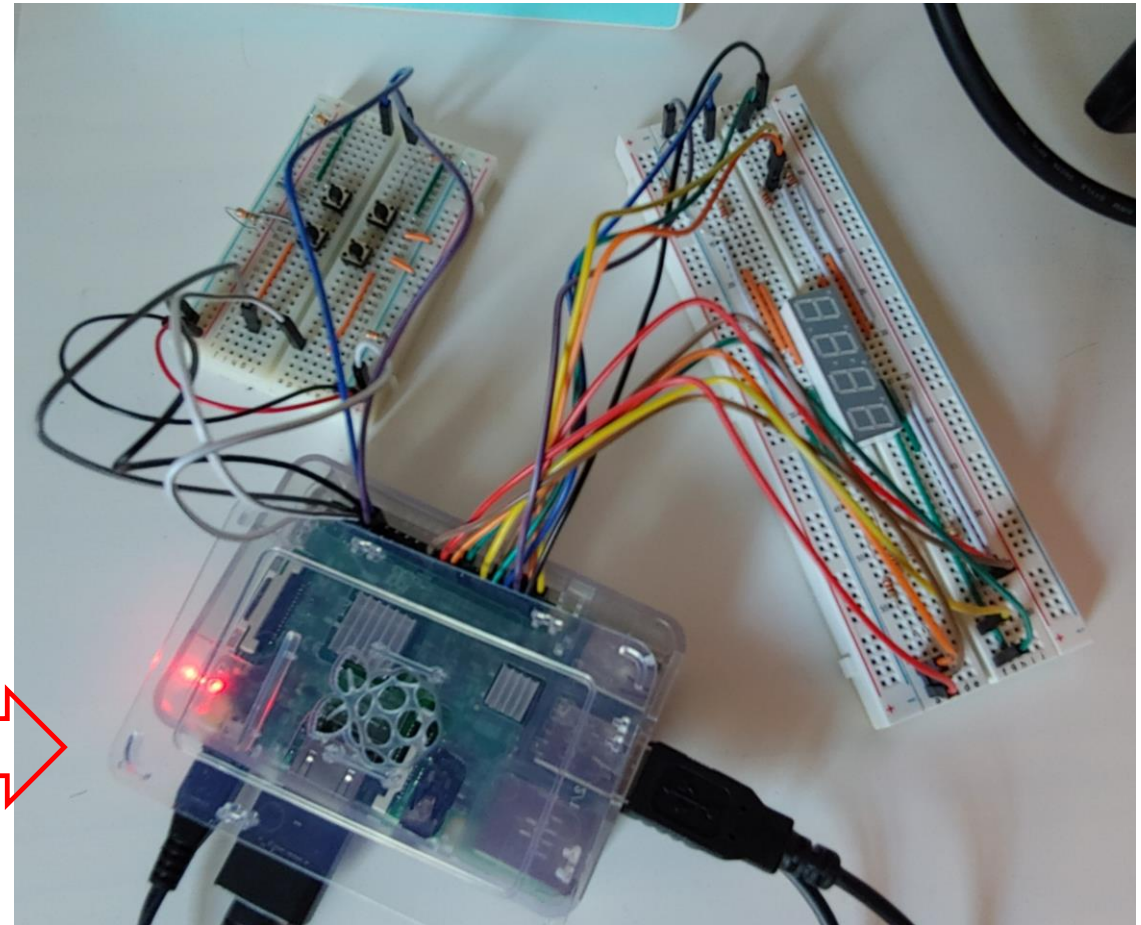
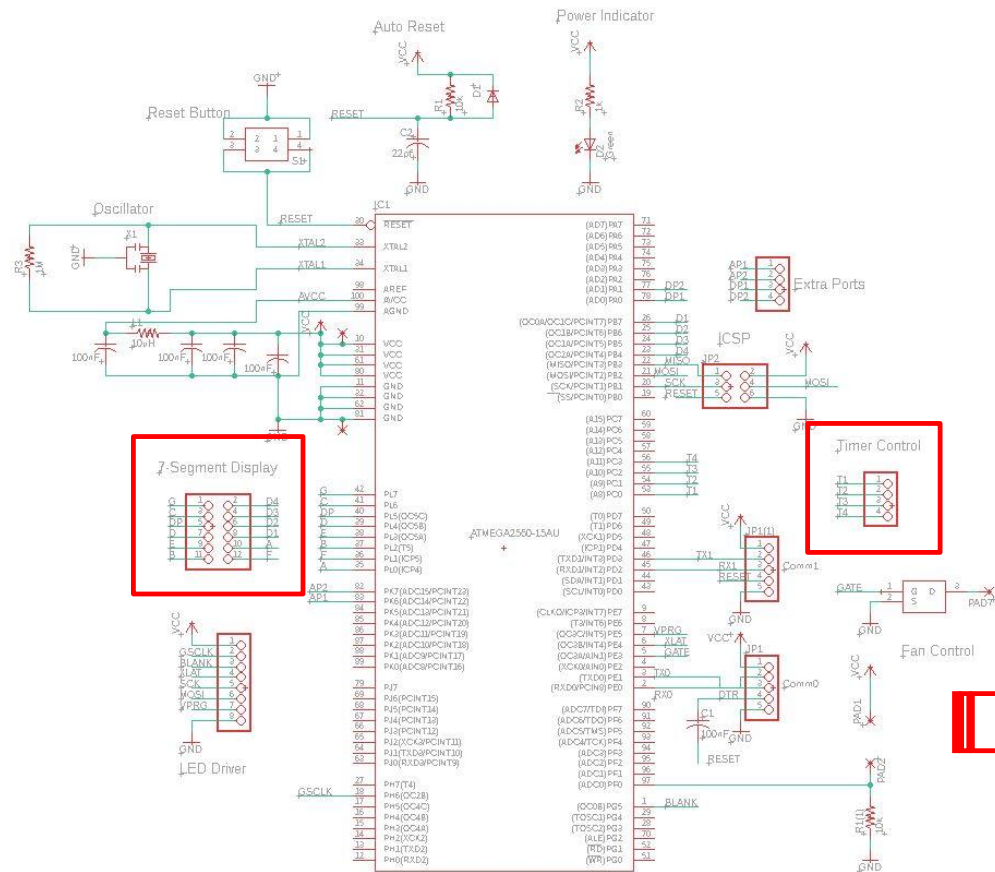
- Donated PC speakers placed inside table
- Effects correspond to lighting effects
 - E.g. explosion sound for fireball effect, chimes for magic
- Attached to PC by 3.5 mm audio jack

PCB DESIGN – TIMER

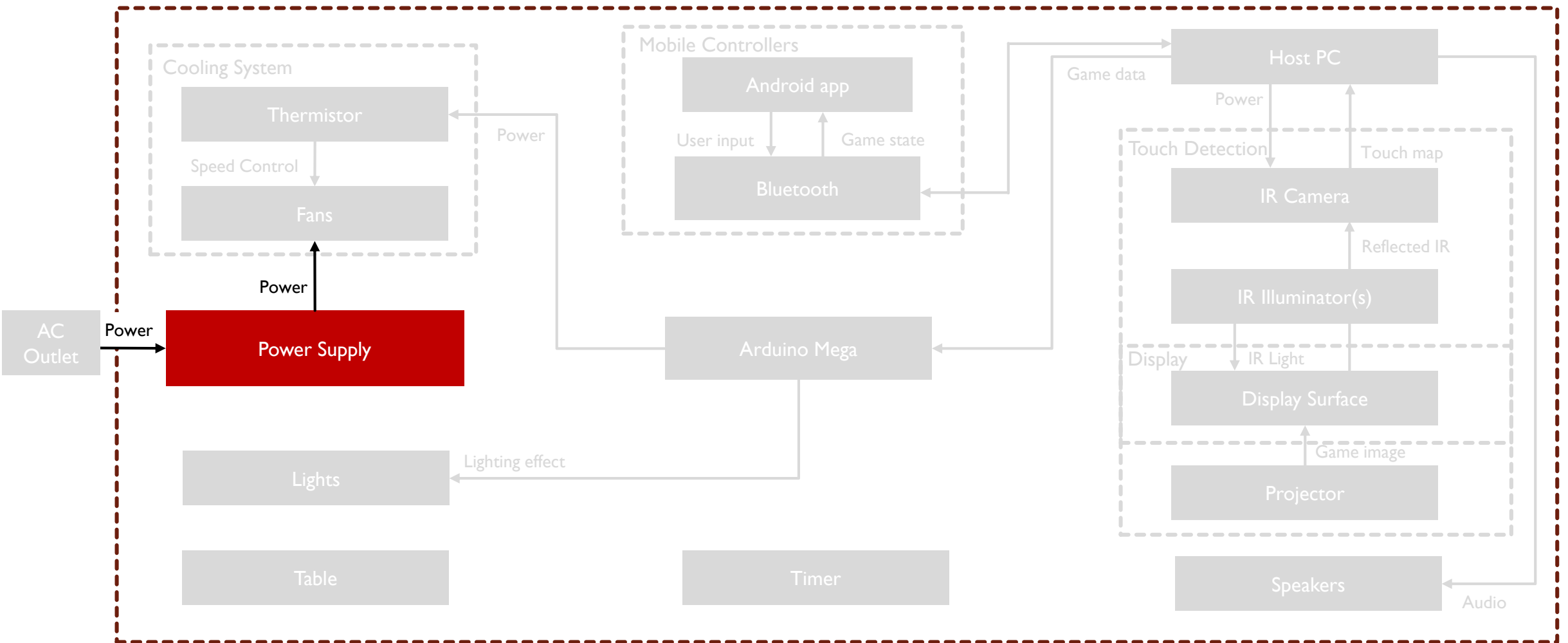


Group 30 Gaming Wizard

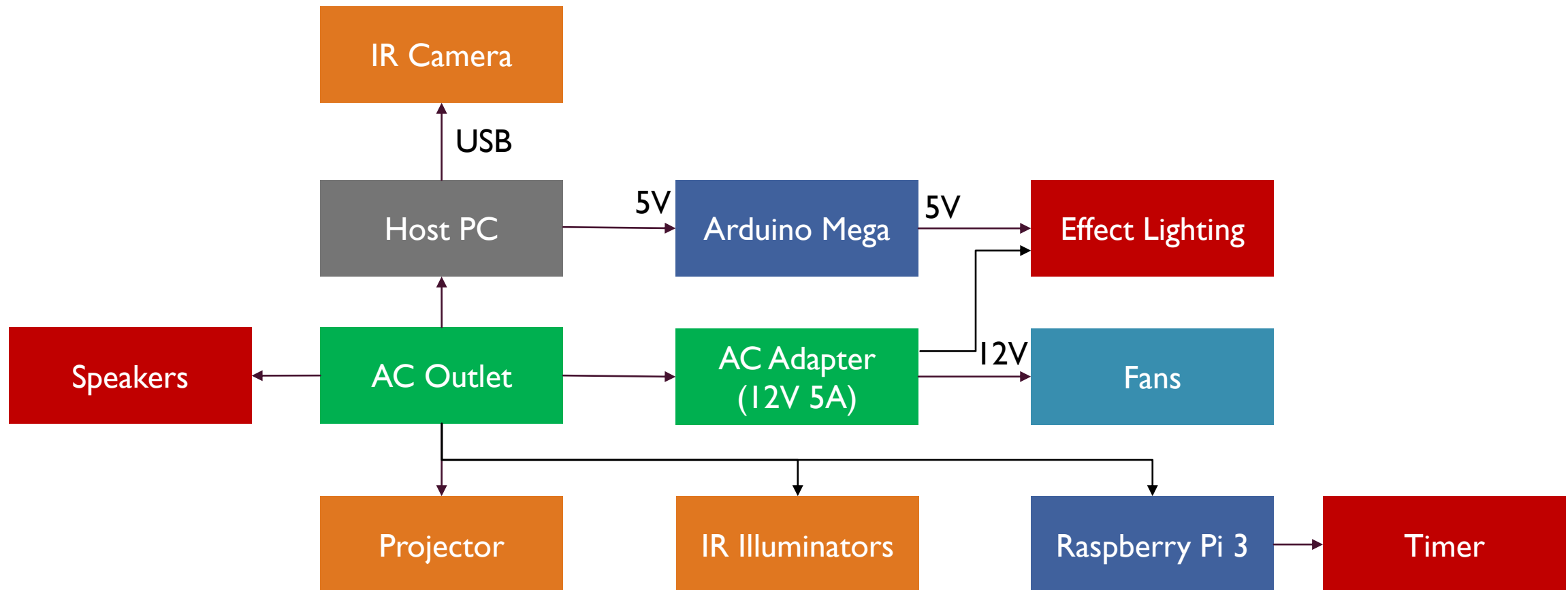
RASPBERRY PI – TIMER



HARDWARE – ADDITIONAL FEATURES



POWER SYSTEM - DIAGRAM

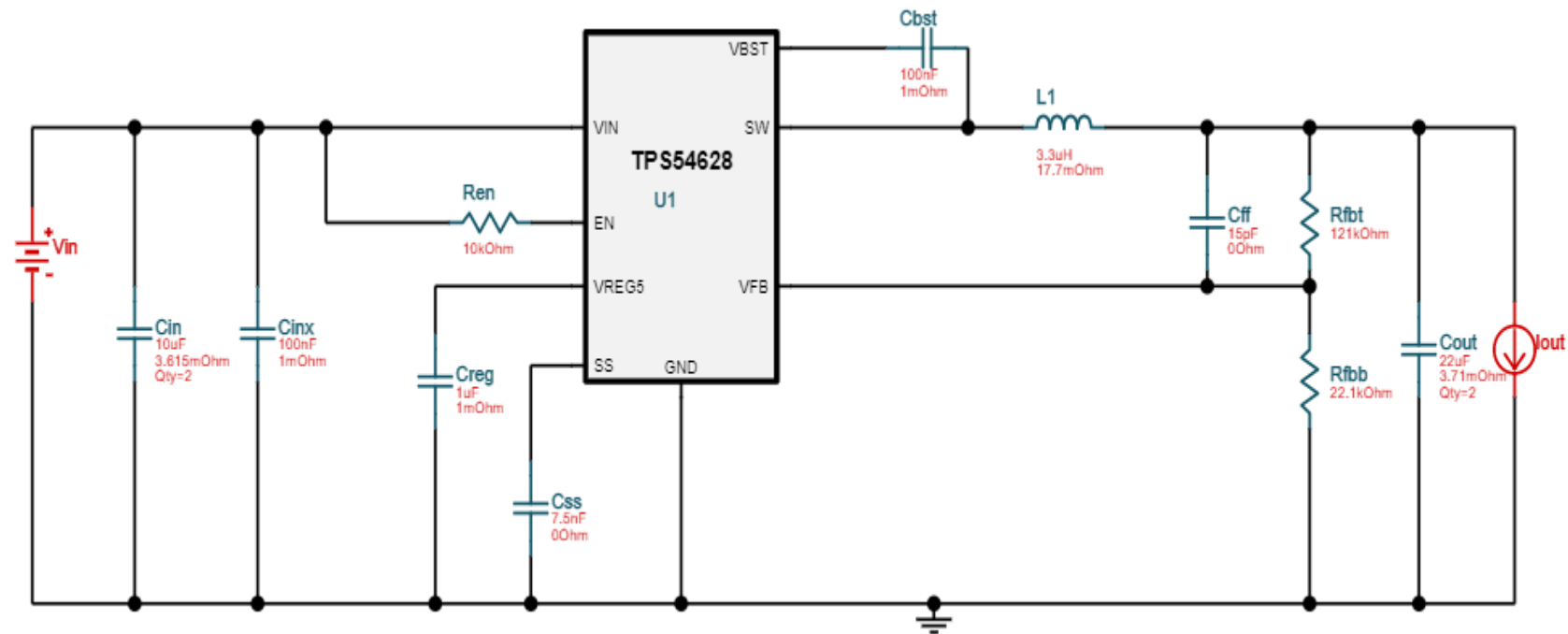


POWER SYSTEM – REGULATOR SCHEMATIC

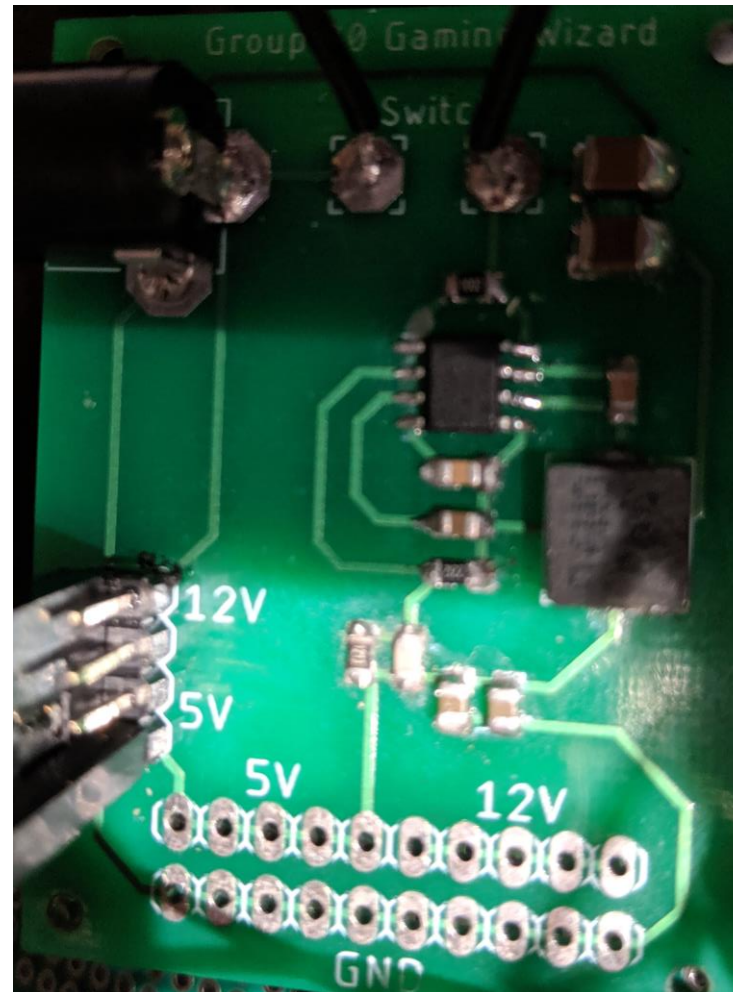
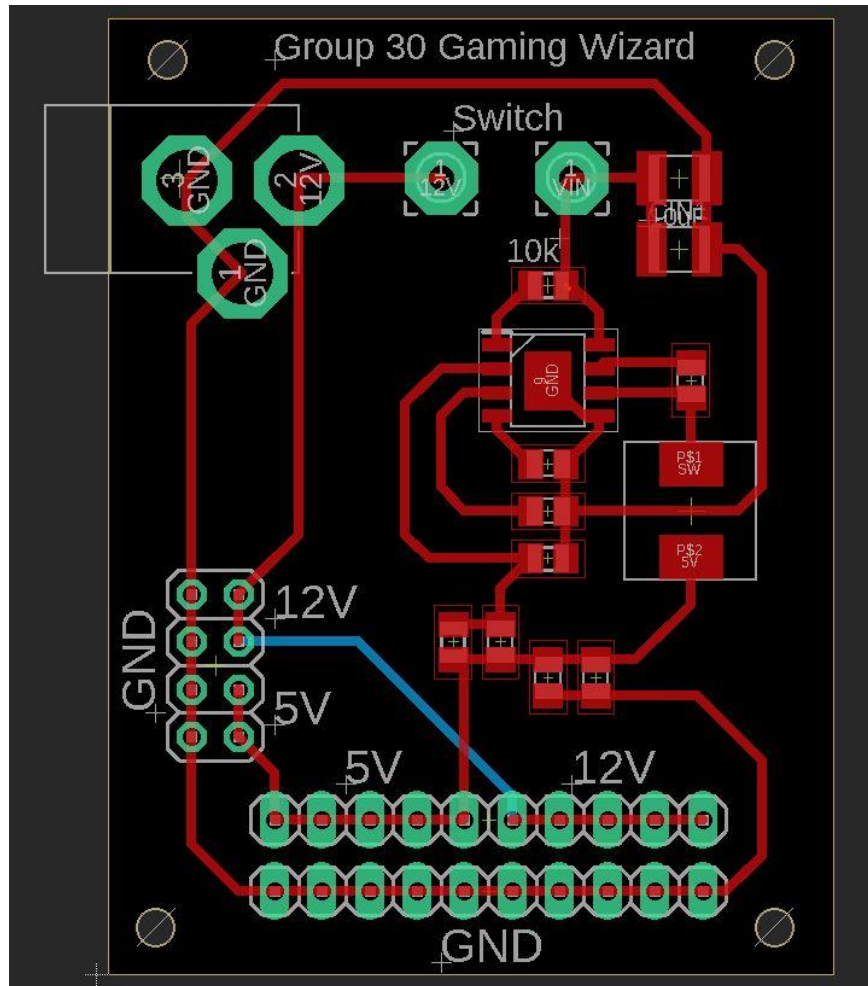


Voltage Regulator – TPS54628

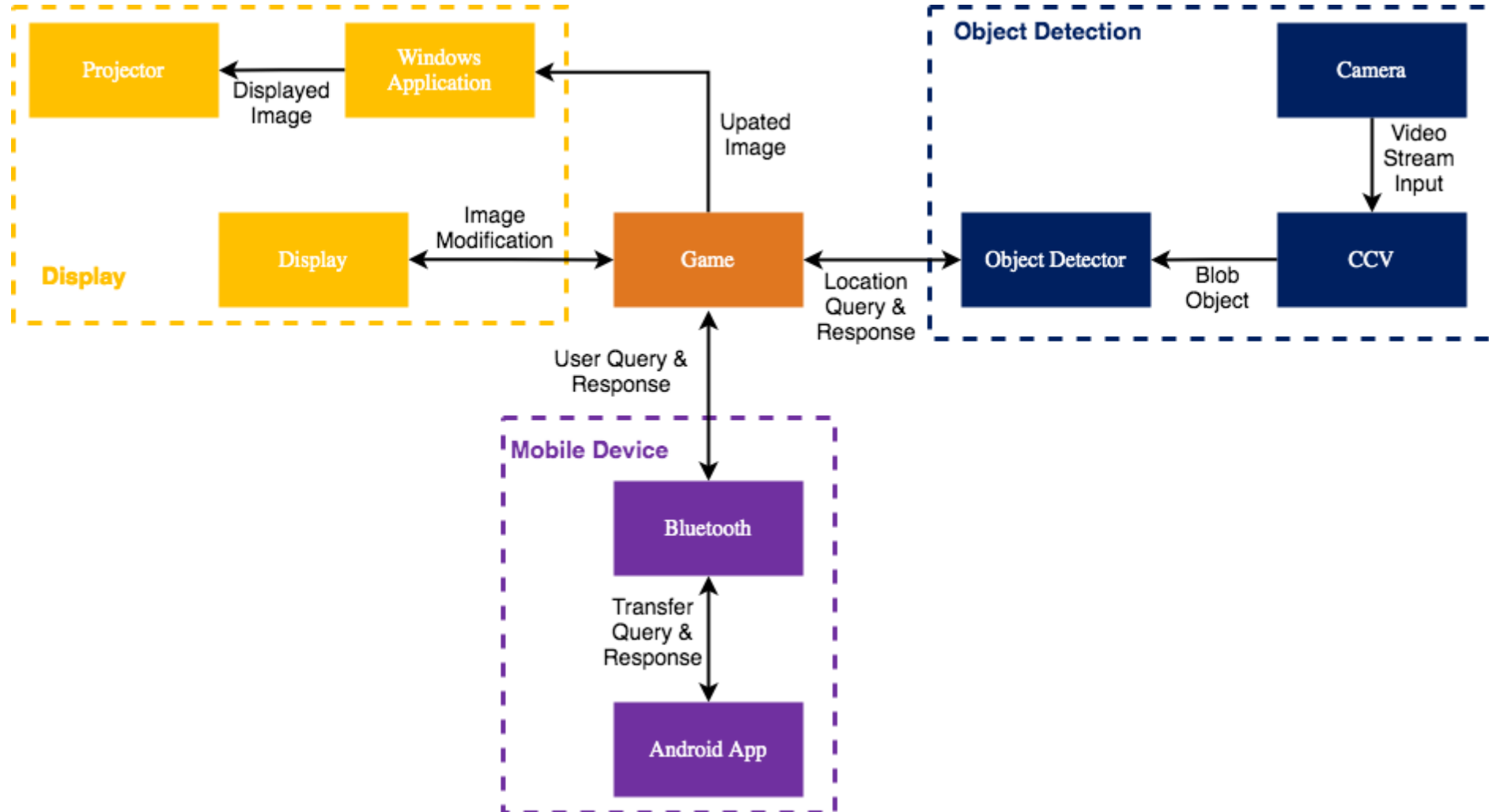
- High efficiency, low part count, low cost.
- 12V input and 5V output.
- 6A maximum output current.
- Barrel jack for 12V input.
- Solder points for power switch.
- Pin headers for easy access to 12V and 5V



PCB DESIGN – POWER SYSTEM BOARD



PROPOSED SOLUTION – SOFTWARE

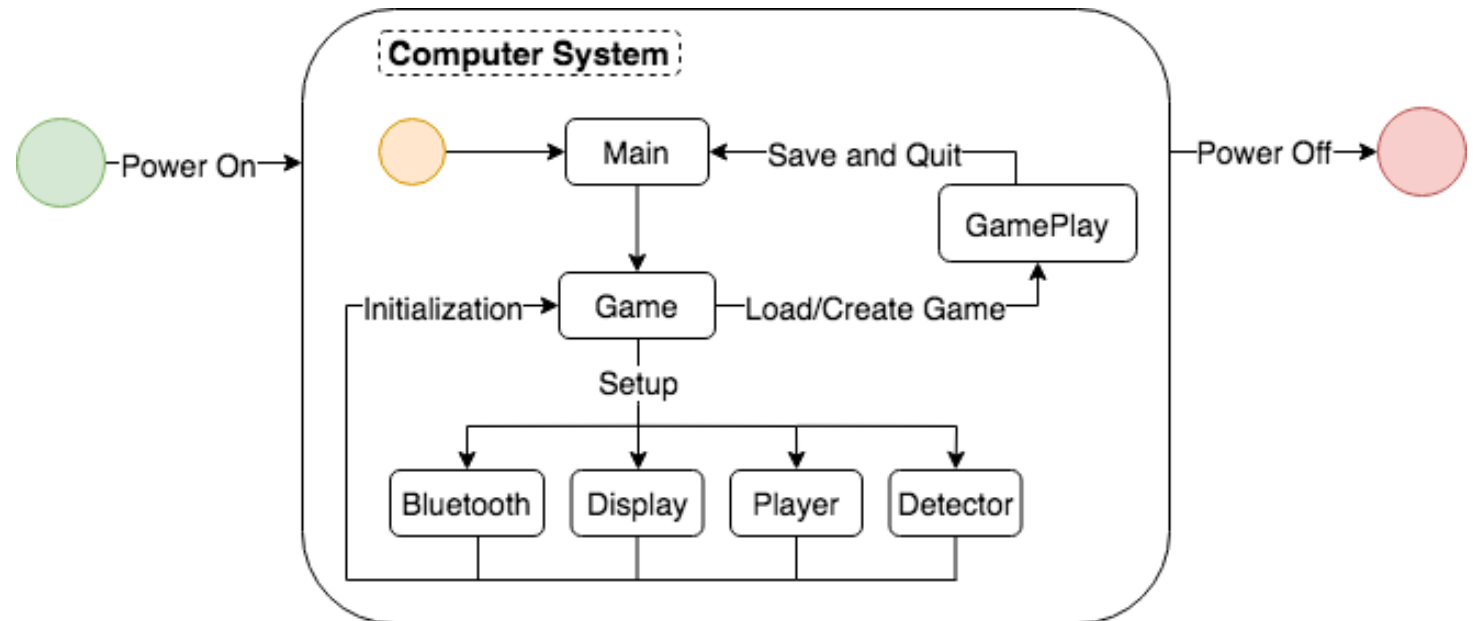


GENERAL SOFTWARE FUNCTIONALITY



General Flow of the Program

- Windows Application is the starting point of the software
- Spawns a thread to begin Game initiation
- Game instantiates Bluetooth, Display, Player(s), and Detector objects
- Game maintains game flow and communication until power off event



GAME



Game Class Purpose:

- Maintain logical control of the game
 - Keep track of turns
 - Maintain mapping of a player to their mobile device and player piece
 - Update display
- Handle inputs from all software subsystems

Game
+ display: Display
+ detector: ObjectDetector
+ bluetooth: Bluetooth
+ players: std::vector<Player>
+ npcs: std::vector<NPC>
+ Gameplay(void): void
+ MessageHandler(int Mode, int Device_Index): void
+ MessageResponder(void): void
+ ProcessPoint(int x_pos, int y_pos): void
+ AutoSave(void): void
+ SaveGame(void): void
+ LoadGame(void): void

PLAYER



Player Class Purpose:

- Object to create distinct players for the game
- Maintains player stats and location information
- Parent class to NPC's and human players
 - NPCs: Image path
 - Human Players: Device ID

Player
+ x_pos: Int
+ y_pos: Int
+ GM: bool
+ Attributes: json
+ bluetooth_id: SOCKADDR_BTH
+ IsGM(void): bool
+ GetXPos() Int
+ GetYPos(void): Int
+ GetBluetoothID(void): SOCKADDR_BTH
+ GetPlayerAttributes(void): json

DISPLAY



Display Class Purpose:

- Image processing in the background
 - Take user provided image, add gridlines, and create map to be displayed
 - Spawn NPC images in desired locations
 - Create special effects for movement and attack phases
- OpenCV framework
- Creating images to be displayed by the windows application methods

Player
+ PPI_X: Int
+ PPI_Y: Int
+ Occupied: bool[]
+ OpenImage(std::string): void
+ PrepareMap(std::string) void
+ DrawGrid(std::string): void
+ DisplayActiveNPCs(): void
+ CleanSpot(void): void
+ DisplayRegionOfEffect(Int Type, Int Distance): void

OBJECT DETECTION



Community Core Vision (CCV)

- Blob tracking software with computer vision
 - Used to track player pieces and finger touches
- Supports FTIR, DI, DSI, and LLP
- Open Source
- Uses TUIO API to store and transmit information

Minimum System Requirements

CPU	Pentium 4
Ram	512 MB
GPU (Optional)	Modern GPU
Operating System	Windows, Mac, Linux
Peripherals	Camera

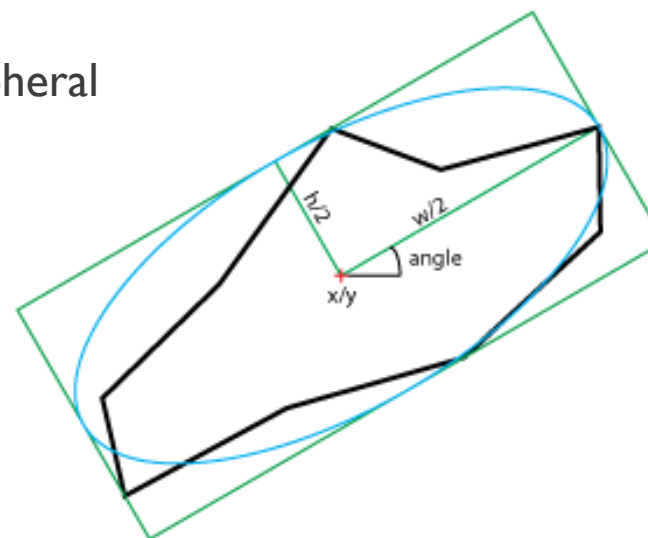
OBJECT DETECTION



Tuio objects

- API provides data structures for Blobs and Cursors
- API provides protocols to transmit information between programs
 - TCP/UDP sockets
- Normalized values based on resolution of peripheral camera

Parameter Name	Parameter Meaning
s	Session ID (temporary object ID)
x, y, z	Position
a, b, c	Angle
w, h, d	Dimension
f, v	Area, Volume



OBJECT DETECTION



ObjectDetector Class Purpose:

- Open, maintain, and handle TUIO connection with CCV
- Receive and decode blob information
 - Translate relative location to a grid location
- Package and store in shared memory
- Requires its own thread
 - Needs to poll CCV to not miss an event

ObjectDetection
+ DetectedList: TuioCursor[]
+ addTuioCursor(TuioCursor *tcur): void
+ updateTuioCursor(TuioCursor *tcur): void
+ removeTuioCursor(TuioCursor *tcur): void
+ StartDetection(): void
+ EndDetection(void): void

MOBILE APP CONNECTION



- Connection made with a Bluetooth connection
- PC and mobile device must have Bluetooth enabled
- Windows API required to create connection with other devices
- Communication through json messages.
 - Example: {"action": "Request GM Information"}

Bluetooth Class Purpose:

- Setup a thread per connected mobile device to maintain uninterrupted connection to each mobile device
- Handle data transfer and storage

Bluetooth
+ ConnectedDevices: std::vector<SOCKET>
+ SendBuffer: char [][]
+ ReceiveBuffer: char [][]
+ StartUp(void): void
+ BroadcastGUID(void): void
+ Connect(): SOCKET
+ SendData(int device_index): void
+ ReceiveData(int device_index): void
+ Server(std::future<void> futureObj, int index): void
+ Client(std::future<void> futureObj, int index): void

SYSTEM REQUIREMENTS



Recommended Specifications:

- CPU: Pentium 4 or better
- RAM: 512 MB
- GPU: Any Modern Card (Optional)
- Disk Space: 100 MB
- OS: Windows 10
- Bluetooth capability

Testing System Specifications:

- CPU: Intel Core i5-4210H
- RAM: 8 GB
- GPU: NVIDIA GeForce GTX 965M
- Disk Space: 500 GB Free
- OS: Windows 10 Pro v1909, 64-Bit
- Bluetooth capability

MAIN MENU



Gaming Wizard

New Game

Load Game

Quit



BLUETOOTH – PAIRING IN PC



Pair New Device

The interface is divided into two main sections. On the left, a 'Known Device List' box contains the text: 'No devices found. Enable Bluetooth on your device and refresh.' Below this is a Windows-style 'Add a device' dialog box with the title 'Add a device' and the instruction 'Choose a device or printer to add to this PC'. The dialog shows 'Searching for devices' and a progress bar. At the bottom of the dialog are 'Next' and 'Cancel' buttons. On the right, a 'PAIR NEW DEVICES' section contains the instruction: 'If your device does not appear in the list, add a new device and refresh. Once all device's are known, press ready.' Below this are 'Add New Device' and 'Refresh' buttons. At the bottom of the right section are 'Ready' and 'Main Menu' buttons. A large circular logo with a bull's head silhouette is centered in the background.

Devices Paired

The interface is divided into two main sections. On the left, a 'Known Device List' box contains the text: 'Device Name: Gabriel Pixel' and 'Last Seen: 04/06/20 10:13:21 AM'. On the right, a 'PAIR NEW DEVICES' section contains the instruction: 'If your device does not appear in the list, add a new device and refresh. Once all device's are known, press ready.' Below this are 'Add New Device' and 'Refresh' buttons. At the bottom of the right section are 'Ready' and 'Main Menu' buttons. A large circular logo with a bull's head silhouette is centered in the background.

CONNECTIONS AND SELECTING GM



Connected Device List

Device Name: Gabriel Pixel

CHOOSE A GAME MASTER

Connect your devices and select a GM.

GM Selected

Gabriel Pixel



Ready

Refresh

Main Menu

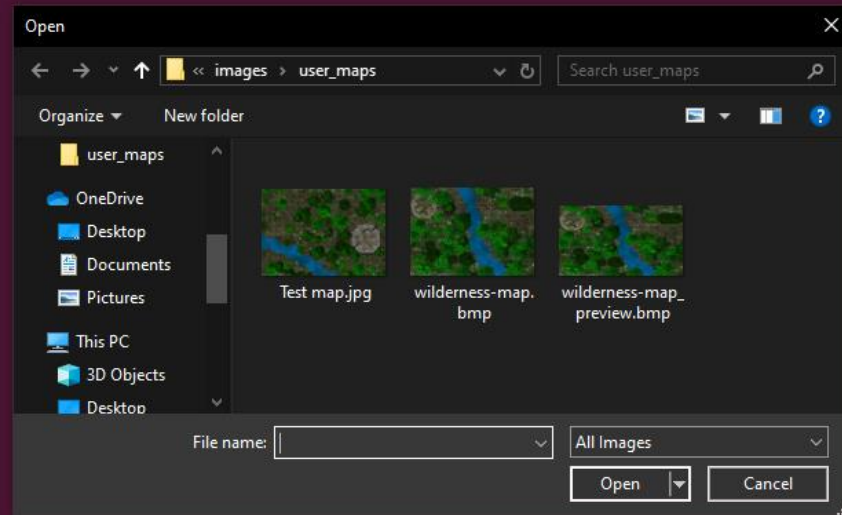
SELECTING A MAP



Map Preview



MAP SELECTION



Ready

Open Map

Main Menu

GAME ENCOUNTER – NPCs ONLY



LOAD GAME



Saved Games

Game Name: Game_1
Last Saved: 04/04/20 20:07
Number of Players: 1
Current Encounter Name: Encounter 3
Current Map Name: Test map



Game Name: Game_2
Last Saved: 04/04/20 20:18
Number of Players: 1
Current Encounter Name: Encounter 2
Current Map Name: Test map



Game Name: Game_3
Last Saved: 04/06/20 12:08
Number of Players: 0
Current Encounter Name: No Selected Encounter
Current Map Name: No Map Selected



Game Name: Game_4
Last Saved: 04/06/20 12:38
Number of Players: 0
Current Encounter Name: No Selected Encounter
Current Map Name: No Map Selected



Previous
Page

1/1

Next
Page

SELECT A SAVE FILE

Save Selected

Game Name: Game_3
Last Saved: 04/06/20 12:08
Number of Players: 0
Current Encounter Name: No Selected Encounter



Ready

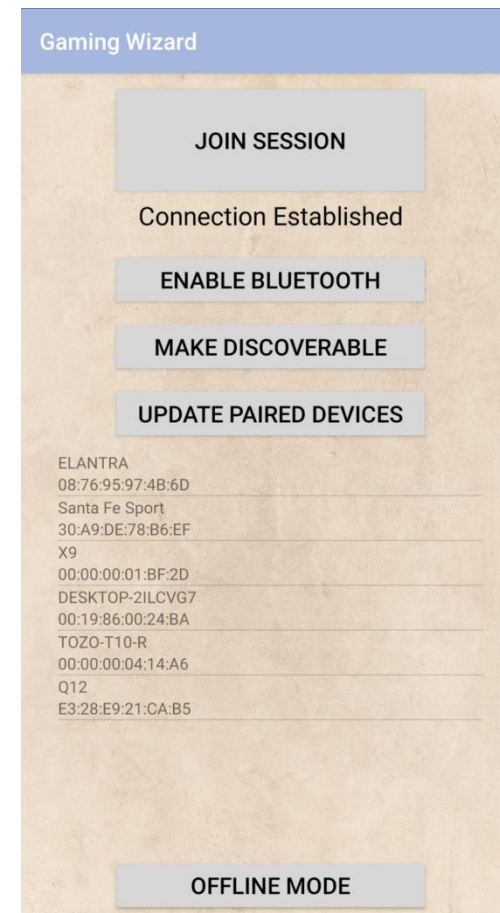
Main Menu

APP BLUETOOTH SETUP



Bluetooth Setup

- Enable Bluetooth and Make Discoverable
 - Allows for pairing between PC and phone
- Paired Devices
 - Displays list of already paired devices to then establish a connection to
 - Once a device name is clicked it will try to establish a Bluetooth connection as a client
- Join Session
 - Once a connection is made, this button will take the user to the choose role screen, the connection will remain as long as the app or PC app is not closed
- Offline Mode
 - The app is usable without a Bluetooth connection for personal use as a character or GM sheet



Bluetooth Connection

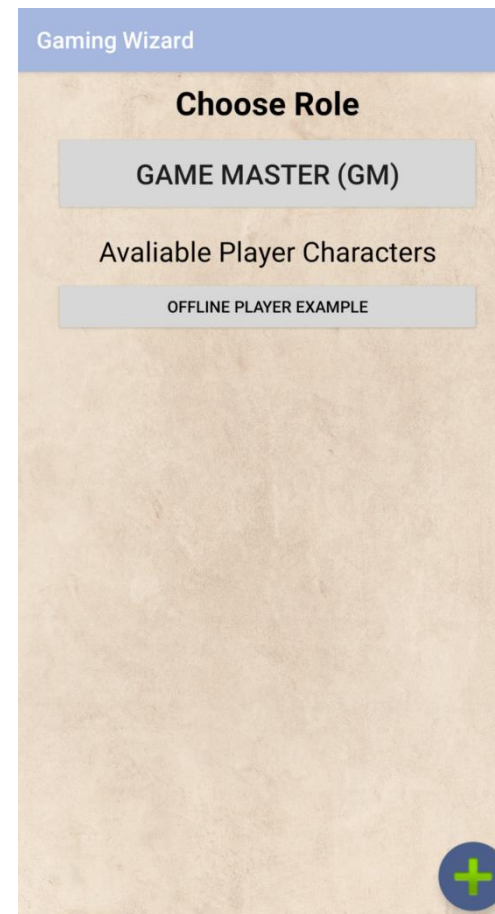
- mBluetoothConnection: BluetoothConnectionService
- mBTDevices: BluetoothDevice[*]
- join_session_button: Button
- enable_bluetooth: Button
- make_discoverable: Button
- list_paired_devices: Button
- offline_mode_button: Button

CHOOSE ROLE



Choosing a Role

- GM
 - Controls the game by picking encounters, controlling NPCs, and turn order. Current chosen campaign's GM info is sent to app through Bluetooth
- Player
 - Play as a character in a campaign controlled by the GM. Current available players are stored in the PC
- “+” Button
 - Add new character to the game session, goes to the add new character screen



Choose Role
- gm_selected: GM
- player_list: Player[*]
+ addCharacter(View): void

ADD NEW CHARACTER



Player Creates New Character

- Input New Character Stats
- Finish Creation Button
 - Will add the new character to the game session and bring the player back to the choose role screen

Input character name **Race:** Choose Race

Character Name

Class: Choose Class

Ability scores without modifiers

8	8	8
Str Score	Dex Score	Con Score
8	8	8
Int Score	Wis Score	Cha Score

Select up to 4 skills

<input type="checkbox"/> Acrobatics	<input type="checkbox"/> Insight	<input type="checkbox"/> Performance
<input type="checkbox"/> Animal Handling	<input type="checkbox"/> Intimidation	<input type="checkbox"/> Persuasion
<input type="checkbox"/> Arcana	<input type="checkbox"/> Investigation	<input type="checkbox"/> Religion
<input type="checkbox"/> Athletics	<input type="checkbox"/> Medicine	<input type="checkbox"/> Sleight of Hand
<input type="checkbox"/> Deception	<input type="checkbox"/> Nature	<input type="checkbox"/> Stealth
<input type="checkbox"/> History	<input type="checkbox"/> Perception	<input type="checkbox"/> Survival

FINISH CHARACTER CREATION

Character Creation

- character_name: String
- character_race: String
- character_class: String
- stats: int(s)
- proficiencies: boolean(s)

+ finishCreation(View): void

GAME MASTER - GAME



GM Controls Encounters

- Select Encounter
 - Clears the PC screen of NPCs and sends the PC the list of new NPCs in the Encounter. This will also display characters in the Turn tab. All lists are scrollable
- New Encounter Button
 - Brings up the new encounter dialog which will pull from the GM's list of made NPCs to create a new encounter

Gaming Wizard

Select Encounter

CLOSE ENCOUNTER LIST

ENCOUNTER 1

ENCOUNTER 2

ENCOUNTER 3

NEW ENCOUNTER

GAME NPC TURN INFO

Game Tab
- encounter_name: Button
- open_encounter_list: Button
- new_encounter: Button

Encounter Name

NPC 1: None

NPC 2: Adult White Dragon CR: 14

NPC 3: Alpha Wolf CR: 3

NPC 4: Pirate Captain CR: 5

NPC 5: None

CANCEL CREATE

GAME MASTER - NPC



The GM's list of NPCs for the Campaign

- Click NPC
 - Clicking the name of an NPC will show the info for that NPC.
- “+” Button
 - Brings up the new NPC dialog which will allow the GM to create a new NPC with up to five attacks.

Gaming Wizard

Beastuary

ADULT WHITE DRAGON CR:14

ALPHA WOLF CR:3

INFO
15HP 13AC Speed: 40FT.
Challenge: 3 EXP: 100

ABILITY SCORES
STR - 8(-1) DEX - 12(+1) CON - 7(-2)
INT - 6(-2) WIS - 8(-1) CHA - 8(-1)

ATTACKS
Bite 1d6 Piercing
Added Mod: STR Range: 5ft.
Claw 1d6 Slashing
Added Mod: DEX Range: 5ft.

PIRATE CAPTAIN CR:5

INFO
25HP 15AC Speed: 35FT.
Challenge: 5 EXP: 1800

ABILITY SCORES
STR - 9(-1) DEX - 15(+2) CON - 10(0)
INT - 13(+1) WIS - 10(0) CHA - 7(-2)

ATTACKS

+

GAME NPC TURN INFO

NPC Tab

- NPC_name: Button
- NPC_info: String
- new_NPC: Button

NPC Name

Armor	Health	Speed
10 AC	10 HP	5 FT
8	8	8
STR	DEX	CON
	INT	WIS
		CHA

Challenge: 5 EXP: 100

Attack 1 Name 5 FT

Damage: 1 d 4 Bludgeoning

Damage mod

STR DEX CON INT WIS CHA

R X N T S A

Attack 2 Name 5 FT

Damage: 1 d 4 Bludgeoning

Damage mod

STR DEX CON INT WIS CHA

R X N T S A





CANCEL CREATE


GAME MASTER - TURN



The GM Controls the Turn Order and NPCs

- Recycler View Item
 - Initiative determines turn order – higher goes first
 - Clicking on an NPC will bring the GM to the NPC control screen
- Begin Button
 - This will sort the characters by highest initiative first and start the turn order
- Right Arrow Button
 - This will make it the next character's turn in the turn order

Gaming Wizard			
	HP 25 AC 15	Pirate Captain	Initiative <u>20</u>
	HP 105 AC 19	Adult White Dragon	Initiative <u>9</u>
		Leon	Initiative <u>7</u>
	HP 15 AC 13	Alpha Wolf	Initiative <u>2</u>

BEGIN **Round 1** 

GAME NPC **TURN** INFO

Turn Tab

- NPC_recy_item: Recycler View Item
- Begin: Button
- right_arrow: Button

GAME MASTER – NPC CONTROL



Not Character's Turn

- Change any stats or name
- Create new attacks
 - New Attack button will bring up the new attack dialog

During Turn

- Anything that can be done when it is not the character's turn can be done now as well
- Move – Sends speed to PC and can click green squares to move
- Place – Click a square on the map to place NPC there
- End Turn – Ends the character's turn
- Attack – Sends range and attack type to PC and creates red squares, click on other character to attack

← Gaming Wizard

Pirate Captain SAVE CHANGES

25	15	9	15	10
HP	AC	STR	DEX	CON
35	FT.	13	10	7
Speed		INT	WIS	CHA

NEW ATTACK | **SELECT ATTACK**

DAGGER 1D10 PIERCING
ADDED MOD: DEX RANGE: 5FT.

SCIMITAR 2D8 SLASHING
ADDED MOD: STR RANGE: 5FT.

MOVE 35FT. **PLACE ENEMY** **END TURN**

NPC Control

- npc: NPC
- move: Button
- place: Button
- end_turn: Button
- attack: Button

Attack Name

Damage: 1 d 4 Bludgeoning

Damage mod

STR

DEX

CON

INT

WIS

CHA

Range

5 FT

CANCEL CREATE

GAME MASTER - INFO



The GM Stores Information About the Campaign

- Save Game Button
 - This saves all current game information for all players including the GM in the host PC
- Text Fields
 - The text fields grow depending on the amount of space needed for the text provided by the GM

Gaming Wizard

SAVE GAME

Locations

locations text

People

people text

Factions

factions

Quests

quests

Loot

loot

Notes

notes

World Background

world

GAME NPC TURN INFO

GM Info Tab

- save_game: Button
- gm_info_tab: String[*]

PLAYER - STATS



The Player's Stats are Displayed here

- Dialogs
 - Clicking on a character's class, proficiency, or ability scores will bring up dialogs to change their values
- Quick Roll
 - Frequently, a player will be asked to roll a D20 during a game session, so this button will randomly give you a number between 1 and 20

Gaming Wizard

Leon
Human Wizard 1

AC 10	HP 15 15	Proficiency +2
STR 0 10	DEX -1 8	CON +1 12
INT +1 13	WIS +2 15	CHA -3 5

QUICK ROLL A D20

STATS SAVES ACTION INFO

Race	Class	Level
Human	Wizard	1
	CANCEL	SET

Proficiency
2
CANCEL SET

Change Ability Scores		
10	8	12
STR	DEX	CON
13	15	5
INT	WIS	CHA
	CANCEL	SET

Player Stats Tab
- character_name: String
- character_race: String
- character_class: String
- stats: int(s)
- quick_roll: Button

PLAYER - SAVES



A Character's Proficiencies

- Checkboxes
 - Each checkbox represents a different proficiency of a character
- Roll Save
 - A D20 + save modifier is rolled for the player

Gaming Wizard

A checked box signifies proficiency in that skill

<input checked="" type="checkbox"/> Strength +1	<input type="checkbox"/> Constitution -1
<input type="checkbox"/> Athletics -1	<input type="checkbox"/> Intelligence -1
<input type="checkbox"/> Dexterity -1	<input checked="" type="checkbox"/> Arcana +1
<input type="checkbox"/> Acrobatics -1	<input type="checkbox"/> History -1
<input type="checkbox"/> Sleight of Hand -1	<input type="checkbox"/> Investigation -1
<input type="checkbox"/> Stealth -1	<input type="checkbox"/> Nature -1
<input checked="" type="checkbox"/> Wisdom +1	<input type="checkbox"/> Religion -1
<input type="checkbox"/> Animal Handling -1	<input type="checkbox"/> Charisma -1
<input type="checkbox"/> Insight -1	<input type="checkbox"/> Deception -1
<input checked="" type="checkbox"/> Medicine +1	<input type="checkbox"/> Intimidation -1
<input type="checkbox"/> Perception -1	<input type="checkbox"/> Performance -1
<input type="checkbox"/> Survival -1	<input type="checkbox"/> Persuasion -1

Select a skill and a saving throw will be made with your skill proficiency taken into account

Skill:

STATS SAVES ACTION INFO

Player Saves Tab

- proficiencies: Checkbox(es)

- roll_save: Button

PLAYER - ACTION



Interactions With the Game Session

- A player character's actions are the same as an NPC, but they use a physical piece instead of an image on the screen
- A player is still limited in the same respect on what they can do based on whether it is their turn or not

Gaming Wizard

MOVE 30FT. PLACE PLAYER END TURN

Attacks

UNARMED STRIKE 1D4 BLUDGEONING
ADDED MOD: STR
RANGE: 5FT.

NEW ATTACK

STATS SAVES ACTION INFO

Speed

30 FT.

CANCEL SET

Attack Name

Damage: 1 d 4 Bludgeoning

Damage mod

STR

DEX

CON

INT

WIS

CHA

Range

5 FT

Proficient

CANCEL CREATE

Player Action Tab

- move: Button

- place: Button

- end_turn: Button

- attack: Button

PLAYER - INFO



The Player Stores Information About Their Character

- Save Character Button
 - This will save all current character information in the host PC
- Text Fields
 - The vertical text fields grow depending on the amount of space needed

Gaming Wizard

SAVE CHARACTER

Copper (CP)	Silver (SP)	Electrum (EP)	Gold (GP)	Platinum (PP)
0	0	0	0	0

Initiative 0 Experience 0

Equipment

Inventory

Proficiencies

Feats

Languages

Notes

Background

STATS SAVES ACTION INFO

Player Info Tab

- save_character: Button
- info_tab: String[*]

DIVISION OF LABOR



Hardware Team

Category	Logan	Erica
Cooling System	Primary	Secondary
Display	Secondary	Primary
Extra Features	Secondary	Primary
PCB Design	Primary	Secondary
Microcontroller	Primary	Secondary
Power System	Primary	Secondary
Effect Lighting	Primary	Secondary
Table	Secondary	Primary
Touch Detection	Secondary	Primary

Software Team

Category	Gabe	Daniel
PC Game	Secondary	Primary
Touch and Object Detection	Secondary	Primary
Bluetooth	Primary	Secondary
App Development	Primary	Secondary
Special Effects	Secondary	Primary

BUDGET



Factors

- No financial sponsor for our project, so all financial burden is placed on the group
- Set budget to be \$700, and cost of materials and equipment purchased was around \$640
- Tried to minimize cost of items through deals and use of already owned materials
 - Laptops, breadboards, speakers, etc.

Item	Source	Cost	Number	Tax	Shipping	Total
Projector – BenQ MX810ST	ebay - voltarea	\$ 178.76	1	\$ 0.00	\$ 0.00	\$ 178.76
PS Eye Camera	Amazon	\$ 8.70	1	\$ 0.00	\$ 0.00	\$ 8.70
Camera Driver	Code Lab	\$ 3.00	1	\$ 0.00	\$ 0.00	\$ 3.00
Floppy Disk	Donated	\$ 0.00	1	\$ 0.00	\$ 0.00	\$ 0.00
Drafting Paper	Blick Art	\$ 14.94	1	\$ 1.82	\$ 9.95	\$ 26.71
PCBs	JLCPCB	\$ 10.00	1	\$ 0.00	\$ 17.70	\$ 27.70
Assorted PCB Components	LCSC via JLCPCB	\$ 17.15	1	\$ 0.00	\$ 19.32	\$ 36.47
Tendelux IR Illuminator	Amazon	\$ 19.98	2	\$ 0.00	\$ 0.00	\$ 39.96
7-Segment LED Display	Digi-Key	\$ 3.96	1	\$ 0.00	\$ 0.00	\$ 3.96
Raspberry Pi 3	Donated	\$ 0.00	1	\$ 0.00	\$ 0.00	\$ 0.00
TLC5940 DIP	nooelec	\$ 12.95	1	\$ 0.00	\$ 0.00	\$ 12.95
RGB LEDs	EDGELEC	\$ 8.99	1	\$ 0.00	\$ 0.00	\$ 8.99
12V Fans (2 pack)	Pano-Mounts	\$ 12.99	1	\$ 0.00	\$ 0.00	\$ 12.99
Arduino Mega	Elegoo	\$ 14.99	1	\$ 0.00	\$ 0.00	\$ 14.99
RFPI2NI0LMOSFETS	Riddle Electronics	\$ 6.95	1	\$ 0.00	\$ 0.00	\$ 6.95
12V 3A AC Adapter	IBERLS	\$ 11.89	1	\$ 0.00	\$ 0.00	\$ 11.89
Total – EE and CPE Components				\$ 1.82	\$ 46.97	\$ 394.02

BUDGET CONTINUED



Physical Table Costs

- The components of our physical table and their costs are given in the table to the right

Item	Source	Cost	Number	Tax	Shipping	Total
TABLE						
1/4" x 48" x 96" ply	Home Depot	\$ 22.92	2	\$ 2.98	\$ 0.00	\$ 48.82
1/2" x 48" x 48" ply	Home Depot	\$ 16.08	1	\$ 1.05	\$ 0.00	\$ 17.13
2x2 (leg)	Lowe's	\$ 6.30	4	\$ 1.64	\$ 0.00	\$ 26.84
1x4 (inner brace)	Lowe's	\$ 7.86	2	\$ 1.02	\$ 0.00	\$ 16.74
1x3 (top frame)	Lowe's	\$ 6.76	2	\$ 0.88	\$ 0.00	\$ 14.40
Screws	Lowe's	\$ 2.58	3	\$ 0.50	\$ 0.00	\$ 8.24
Nails	Ace Hardware	\$ 2.75	1	\$ 0.18	\$ 0.00	\$ 2.93
Acrylic	Professional Plastics	\$ 51.99	1	\$ 5.46	\$ 31.95	\$ 89.40
Styrofoam Block	Michaels	\$ 12.99	1	\$ 0.84	\$ 0.00	\$ 13.83
Curtain Rod	Walmart	\$ 4.99	1	\$ 0.32	\$ 0.00	\$ 5.31
Blackout Curtain	Donated	\$ 0.00	1	\$ 0.00	\$ 0.00	\$ 0.00
Total - Physical Table Components				\$ 14.87	\$ 31.95	\$ 243.64

Total - EE and CPE	\$ 1.82	\$ 46.97	\$ 394.02
Total - Physical Table	\$ 14.87	\$ 31.95	\$ 243.64
Grand Total	\$ 16.69	\$ 78.92	\$ 637.66

ISSUES CAUSED BY COVID-19



- Software testing needs at least two android phones which cannot be done easily individually
- PCB order delays and not being able to order another PCB after testing our first one
- Lack of in-person cooperation made software and hardware development difficult
- No access to lab resources for hardware assembly and testing after Spring Break, making diagnosing serial communications problems difficult



QUESTIONS?