GNG 2101

Project Deliverable F: Design Constraints and Prototype 2

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F.1 Design constraints (as a group):

1.1 Non Functional Design Constraints(with justification):

Compliance :

For our design, the client expressed his preference for an app; specifically to manage the macro on the controller. One of the most important parts of our design concept is to “simplify”, on that we will be minimizing the number of joysticks/buttons on the controller. The intention of the app is to allow our client to set systems of macro and save them in the app so that each time he can switch to the proper system for his game/purpose. Our constraint, in this case, is not able to set up systems of macro for specific games as this is still a commodity defined to be traded in exchange for money.

Performance:

The second non-functional design constraint is regarding the sensitivity setting on joysticks. For the adaptive controller, the customizability requirement is half fulfilled and it was to have the physical layout customized to our client's needs. The other half of it we define as our performance constraint, although in theory, the customized layout solves the major issues such as overshooting due to client ability; by altering the sensitivity of the joystick similar to anti-shake functionality on E-pen will maximize the experience for our client. The constraint is due to the insufficient knowledge and time we have regarding the feature.

1.2 Impact of Non-Functional Requirements on Design

Due to the lack of system macros tailored to specific games, we will incorporate a button specifically for switching between different button layouts and macros. This will allow the client to change his settings while in game without the need to pause or waste game time. It will greatly improve his in game performance without putting much strain on the client. This feature will allow us to incorporate less buttons in the design. Since having less buttons opens up a lot of space on the controller, we will space the buttons approximately 5 inches away from the joystick and approximately 1 inch in between each button to avoid missclicks.

The fixed sensitivity on the joystick won’t alter the design in any way, however, to avoid missclicks (should the client's hand fall from the joystick and onto a button) we will have an approximate 5-inch space between the joystick and buttons. The fixed sensitivity allows the client to completely ignore precision movements on the joystick, issues such as overshooting aim or not turning with enough speed are solved.

1.3 Justification for the effectiveness of changes

The changes incorporated do not fully remove the inconvenience the constraint causes. however, it does give the user less trouble when switching between systems of macro. Let's define two approaches to switching systems of macro assuming one with the incorporated button and the other without. Let each physical step the user takes to switch macro denote a point, the higher the

point the less effective the approach is. From the claim I made above in theory approach without the button(can't do due to constraint) will have a lower point(more effective) than the approaches after the changes.
To prove the effectiveness of the changes due to constraint we do not need point(without constraint) < point(changes) instead we can prove that point(changes) > point(with constraint).
Assumptions:

1. Starting from In-game on Xbox.
2. Changing the functionality of the four buttons for the gaming experience.
3. No auto-saving for setting in games for the macro.
4. Buttons return to basic functionality after exiting the game.

With changes: 6

Click the button to get on the app(1)

The user customizes the macros for games(4); only apply when 1st time on the specific game

Chooses the desired system of macros for button(1)

With constraint(there exists more than one method): 5
Assume the basics setting: macros switches are required to be done in-game, with basic functionality on the existing buttons.

Open game setting in game(1)

Change the functionality of the four buttons(4)

Without constraint: 2

Open app(1)

Chooses the desired system of macros for button(1)

The analysis model is not perfect but it should show the overall trend. Given point(with change) = 6 for 1 game, and point(with constraint) = 5. Implying for the first time on a game that the effectiveness is negative. But as the number of times playing each game increases the point(with changes) = 2 while the point(with constraint) remains at 5 assuming no auto save for each game the user plays. However, the assumptions are made given the obtained information from the first and second client meetings hence results can vary by a lot if some key assumptions do not hold true with new information.

To compromise the constraints with joystick sensitivity, the changes are to space out the joysticks and buttons in return for less operation error in-game. Same claim as the above constraint: the changes will not fully remove the inconvenience caused by not being able to incorporate joystick sensitivity.

Let denote the operation error on the regular controller by the user is 100%. Assume 50% is caused by clicking on the wrong key or pushing the controller by accident due to a tremor, and the other 50% is by overshooting when using the joysticks. By incorporating a method assuming no constraint the 50% caused by overshooting will become 0%. However, when incorporating the changes with the constraint we can lower the 50% caused by clicking on the wrong key.

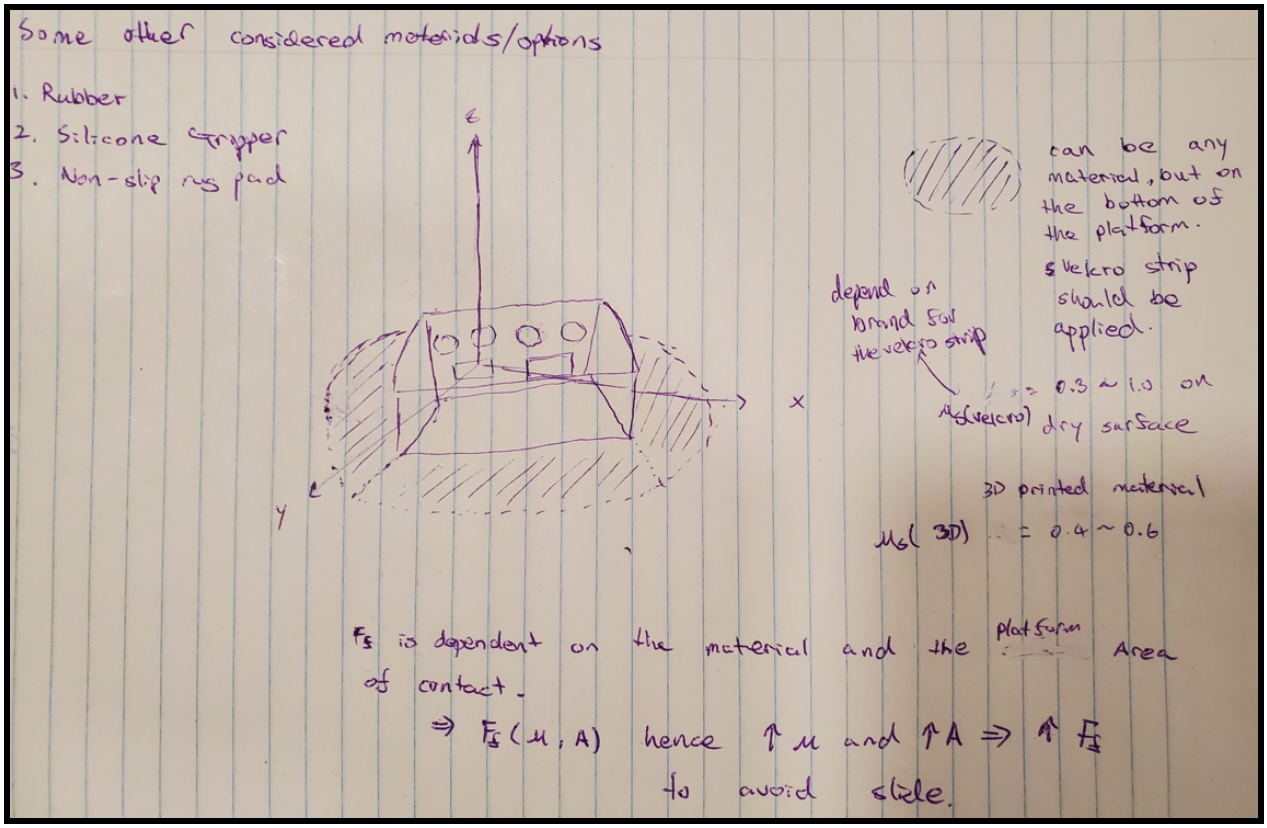
1.4
See 2.4

F.2 Prototype 2 (as a group):

2.1)

During our 3rd client meet, we were able to show and demonstrate the layout of joysticks and buttons on the controller. The client explained that he liked the layout of the design and would like to see it fully implemented. As for new client feedback, there were not any changes in needs/requirements for the design of the controller from the other two meetings. Note: The client did add a sense of urgency on the controller time frame since he is not able to effectively play the game until then.

2.3) Second set of prototypes:

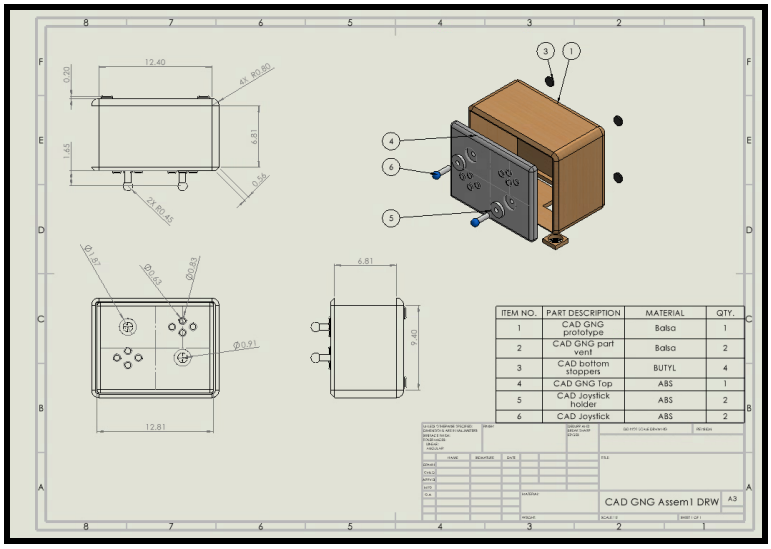


Critical Product Assumptions:

a. Buttons and joysticks are spaced out just enough for the user such that the operation error caused by the user is minimized. Effectiveness can be tested by comparing results from the user for using prototype 2 and the regular product.
b. The weight of the design is enough such that it will not slide as the user is operating on it in his personal gaming environment. The same method can be applied to check the effectiveness.

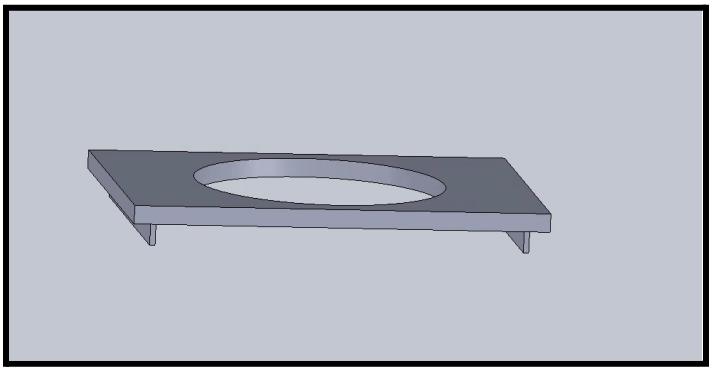
2.4)

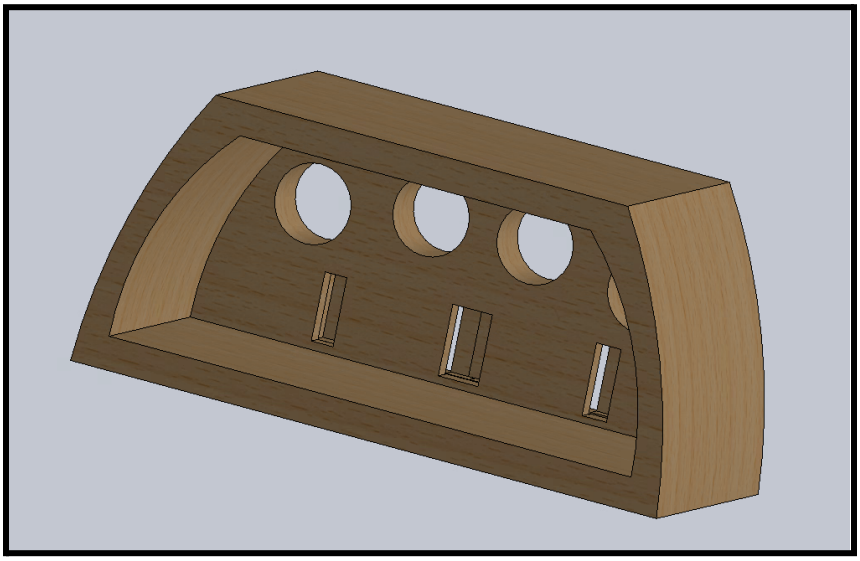
Original Prototype

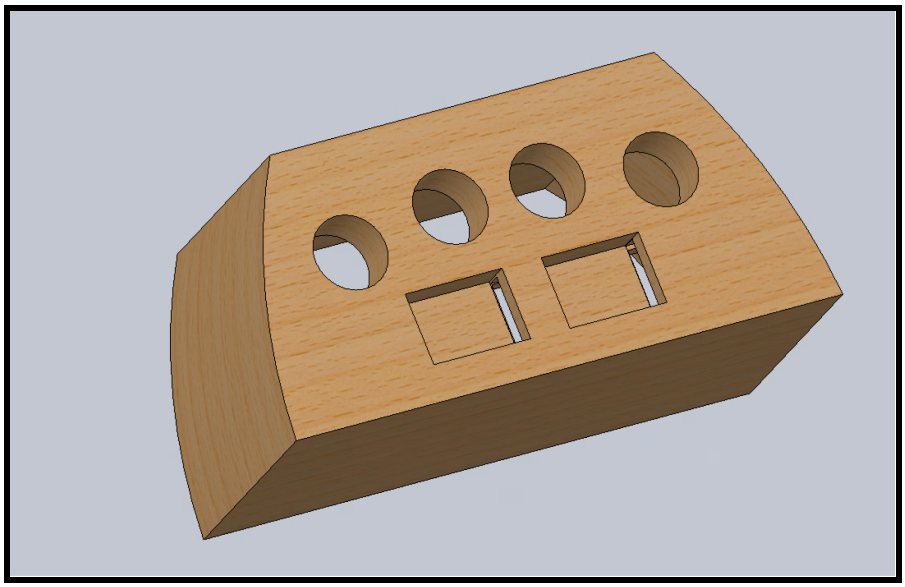


ITEM NO.	PART DESCRIPTION	MATERIAL	QTY.
1	CAD GNG prototype	Balsa	1
2	CAD GNG part vent	Balsa	2
3	CAD bottom stoppers	BUTYL	4
4	CAD GNG Top	ABS	1
5	CAD Joystick holder	ABS	2
6	CAD Joystick	ABS	2

New Design







2.5)

Metric #	Needs #s	Metric	Imp	Unit
1	2, 6, 8, 9	Ergonomics	5	N/A
2	2	Size (Dimensions)	4	cm
3	12	Cost	3	CAD
4	13	Safety	5	N/A
5	2, 6, 8, 9	Ease of usage	5	N/A
6	2, 6, 8, 10, 11	Accessibility	5	N/A
7	1, 3	Compatibility with games played and gaming platform	5	N/A
8	4, 5, 7, 10	Modularity and customization of button implementation	4	N/A
9	14	Controller weight		
10	15	Shape and size of buttons		

2.6)

For this client meet our team's goal is to present the client with a physical prototype so he can understand what the final product will be. The prototype we will be presenting can be found in figure 4, this prototype is 3D printed and engineered based on the clients feedback from client meet 1. In each circular hole goes a button, each button has a different functionality, in each rectangular hole goes a joystick, each joystick with its own set functionality.

It is also important to note that this prototype isn't complete as there is still much 3D printing to be done. However, since this is our second client meet our group wanted to present the client with a physical prototype he can explore, analyze and examine in person and tell us what he likes and doesn't like.

Figure 4: Physical Prototype 1

Our team intends to obtain as much feedback from the client as possible to ensure our final prototype meets his functionality, usability and compatibility requirements. Whether the clients feedback is positive or negative our group will ensure to listen to everything the client has to say and improve the current prototype based on the feedback obtained. Specifically our group is listening for the clients comments on the buttons and joysticks placements and functionality of the overall prototype.

Project Plan Update:

Using Wrike, our team has effectively completed this deliverable and continued to develop our project plan. Using the gantt chart shown in figure 5, our group was able to divide up the work equally and ensure that everyone is satisfied with the dates for each section. As well as keeping an eye on everyone's schedules and factoring in everyone's availability.

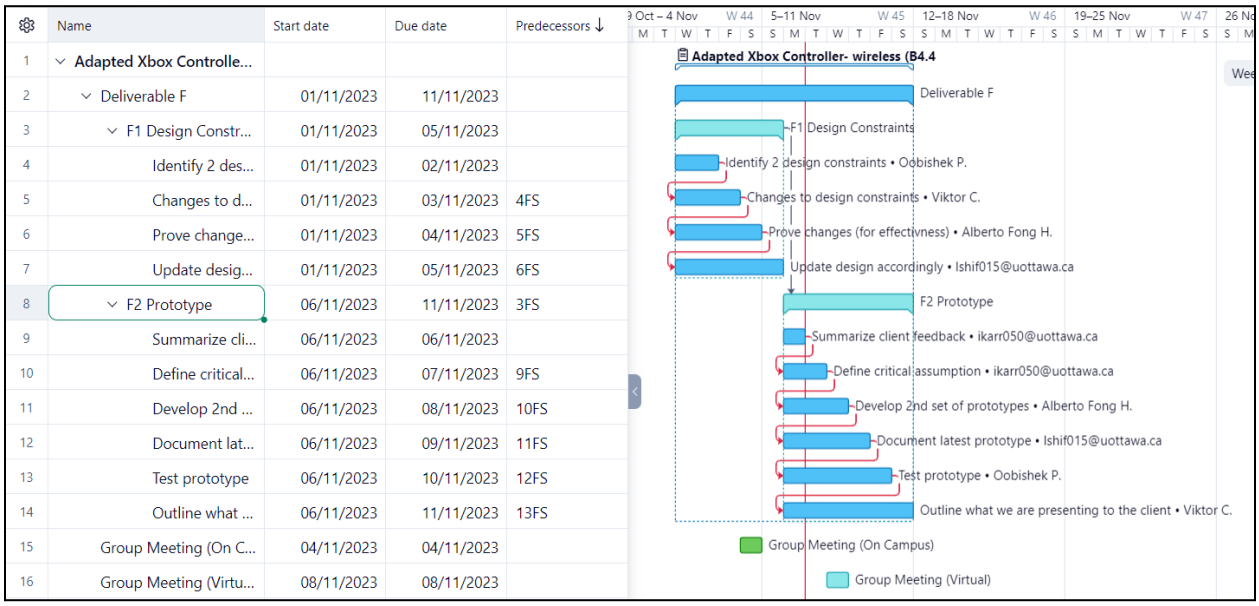


Figure 5: Gantt Chart for Deliverable F