SCHOOL OF COMPUTING

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SECP1513-03

Technology Information System

Design Thinking Project Report

Team Members:

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INTRODUCTION

Design Thinking is a non-linear, iterative process that teams use to understand users, challenge assumptions, redefine problems and create innovative solutions to prototype and test. Design thinking process involves 5 phases –Empathize, Define, Ideate, Prototype and Testing. Design Thinking process is crucial to develop and refine skills to understand the rapid changes in user's environment and behaviours. In Design thinking process our topic is about switching between internal and external graphic card in laptops.

To start with GPU (Graphics cards) is a crucial part of the system unit and especially for Gamers and video editors ,the graphics card is responsible for rendering an image to your screen and it does that by converting the output to a signal that can be understood by the screen the better the GPU is the better and smoother an image can be produced adding on GPUs used in desktop and laptops vary significantly ,in Desktops the power requirement ,thermal footprint and size of the GPU block in not considered an issue because the system case can fit almost any type of GPU and it can be housed with massive air and liquid cooling solutions to maximize the performance on the other hand laptops comes with significant constraints and so you'll usually find a lower clocked GPU chip used in laptops to produce lower temps and lower power drain ,In relation CPU and GPU chips in our laptops are usually soldered to the motherboard ,while some companies offer the upgradeability of the CPU in certain laptops but for the GPU that is usually not the case and what you get inside the laptop is what you're going to keep for the whole period of owning the laptop. So that's why we came up with Our own external GPU dock which will allow the users to combine between desktops GPUs and still maintain their same laptop by connecting the external GPU to the laptop through Pci/e connection and powering the external GPU with a separate power supply which will be all included inside the dock adding on it will help gamers and video editor to be able to use a high spec GPU while still maintain the portability because instead of using a desktop setup which needs the user to be fixed to one place and moving around with desktop is not possible on the other hand for users with low spec laptop and they need a powerful GPU they can benefit from the GPU dock which will maximize their productivity while still maintaining to be cost effective and users can still be able to switch between internal and external GPU using the GPU dock .

EMPATHY

In order to develop an empathetic understanding to the problem you are trying to solve you have to stick to the first step of the process of design thinking which would lead to the most important issues users face in context of dealing with an old laptop

- Artifacting
- Loud fan sounds
- Driver crashes
- Black screens
- Graphic Glitches While Playing Games

Empathy is critical to an arrangement of human-focused advancement, for example, design thinking, as it encourages you to put aside your own reality observations and gain genuine knowledge into clients and their necessities. While GPU in old laptops can cause a lot of problems specially to developers or gamers which would lead to colour looking strange, 3D models will stretch for no reason, “digital snow” will appear, or the entire screen will be covered in visual garbage. We discovered these different issues and we thought it might be a serious problem however it was by all accounts basic after we conducted a meeting with **Dr. Mohd Zahari Bin Abidin** on these issues. After talking to him we came up with a solution that might be way better for users to actually go and buy a new laptop which would be very expensive for such a problem. So our solution is to create a dock for an external GPU that connects through USB connection and that will allow the users to use the latest GPU cart at a low cost.

DEFINE

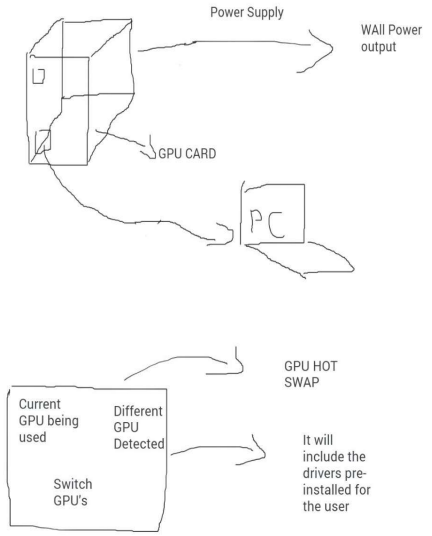
After collecting data from the interviews and from our own personal internet research, we learned that there was a huge contributing factor in installation, and that is the presence of an USB-C Thunderbolt 3 port in the laptop, based on that we concluded there were two scenarios that may happen to individuals who wish to install a new GPU to boost performance.

GPU installation on laptops with thunderbolt 3 port: It's a very simple process, you will need an GPU mounting dock, a dock contains a power supply that will power the external GPU, since we are installing a desktop GPU we also need a desktop power supply to power it, after placing your desired GPU in the dock, you simply plug the USB-C cable attached to your laptop port.

GPU installation on laptops with NO thunderbolt 3 port : This is where it might get tricky, this option is used generally for users who wish to get the most out of their old systems, here we need to use the mini PCI-e Wi-Fi card slot in the laptop, if the laptop has only one, Wi-Fi connection must be sacrificed if installation is truly desired ,to connect it you need to disassemble the laptop bottom cover to access the Wi-Fi slot, which means to use an external GPU, you can't reassemble the cover back.

IDEATE

Ideation is a process of developing and generating new ideas in a creative way. it is a transition from identifying and analysing the problem which were in the early stages of the design thinking process to come up with a wide range of ideas and solutions .One of the most important parts of ideation is that there is no judgement restrictions as the main goal is to produce ideas, categorizing them depending on the evaluation of the ideas execution and the fulfilment of needs.so Through the brainstorming our group had made, we found out with some suggestions and considerations to overcome the problem of GPU limited capabilities in some platforms.

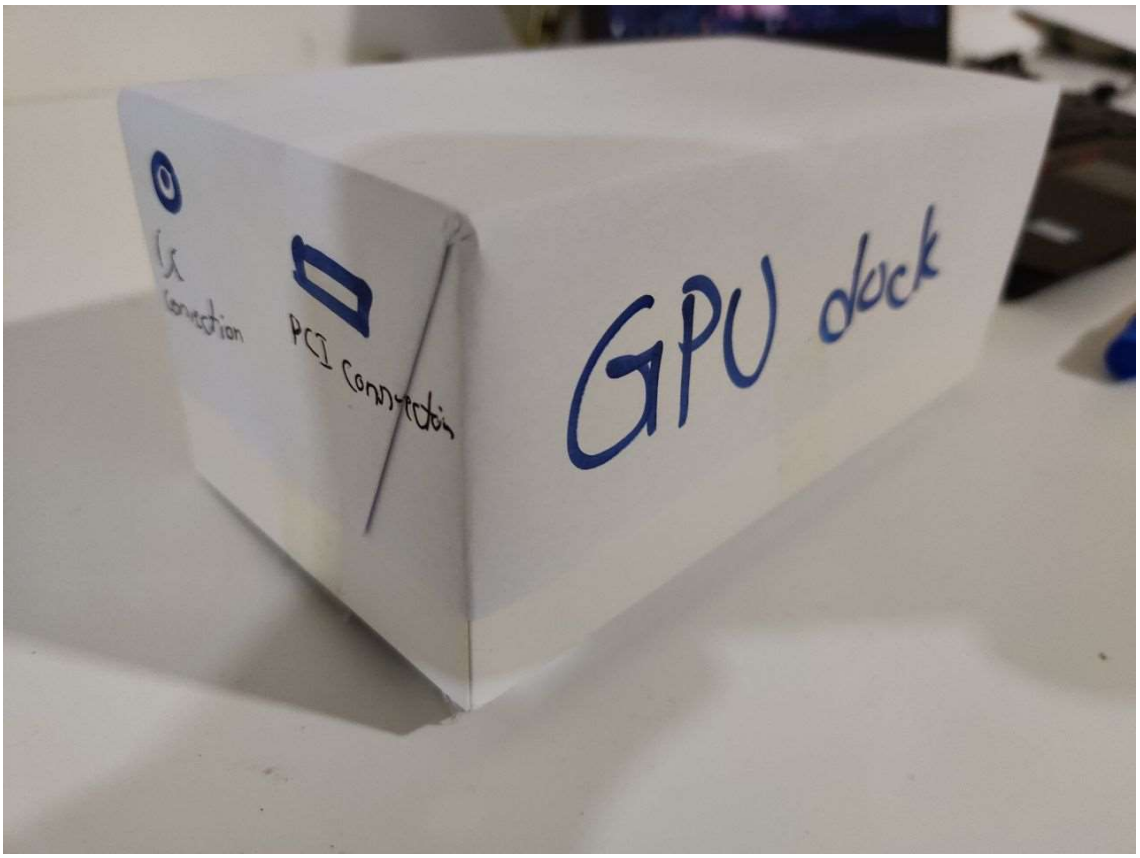


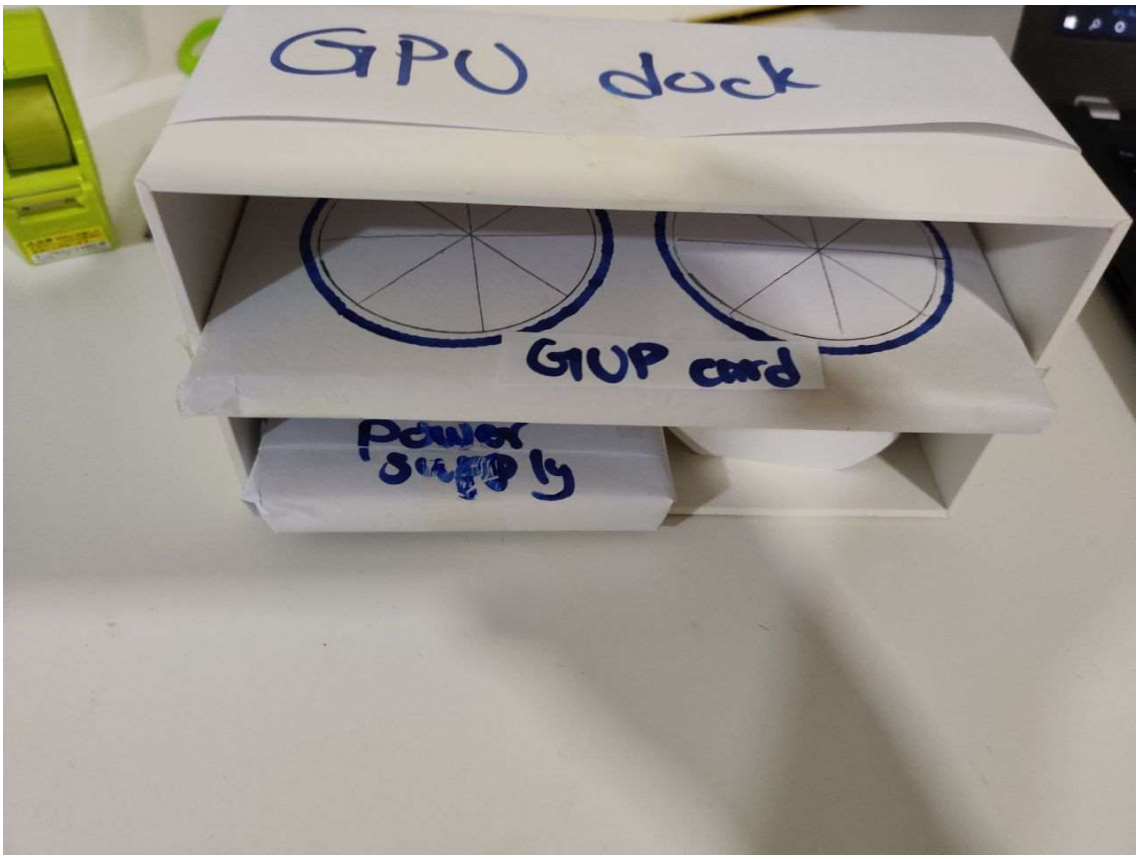
Taking in to account all the consideration gotten in the brainstorming we found that installing an external GPU card will be the best solution with developing a user interface which would make it easier of the user to switch between the internal and the external GPU.

PROTOTYPE

After an incredible amount of brainstorming we were able to conclude our own improvised solution to individuals with no thunderbolt port.

Our solution is very straightforward but very efficient, we design an adapter that is installed to a regular USB 3.0 that has a mini PCI-e port, that way user doesn't have to sacrifice their Wi-Fi connection if their laptops only have one port, and also to avoid the hassle of disassembling the laptop cover each time a surge of performance is needed.

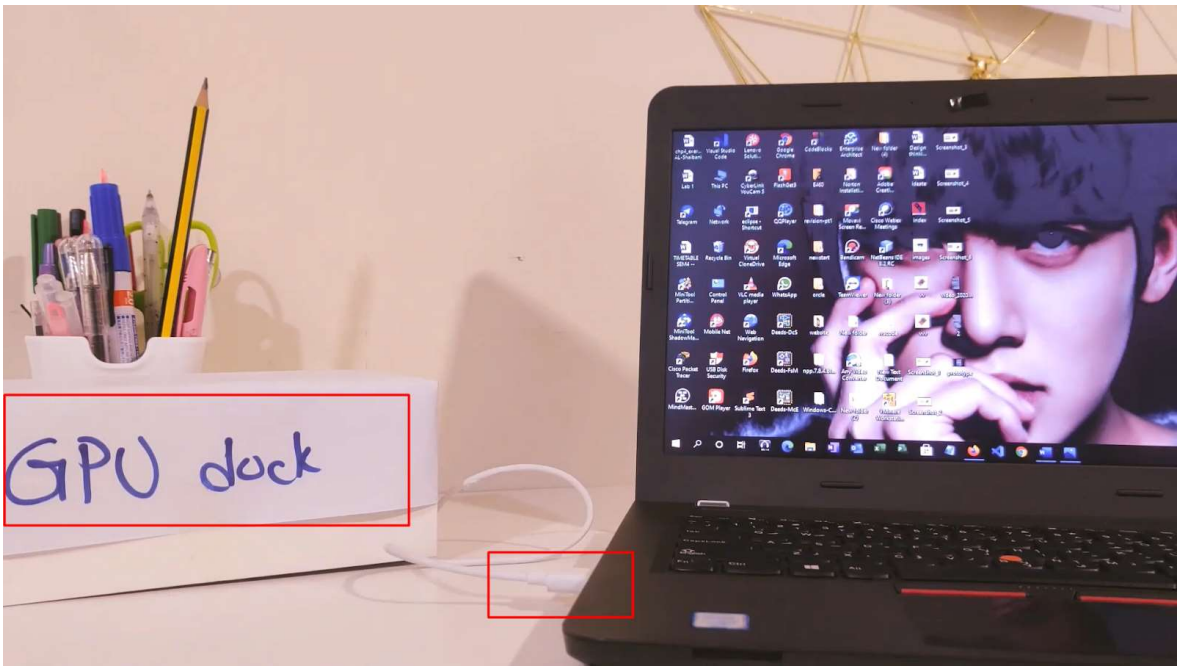



GPU dock
GPU card
power supply

APPENDIX

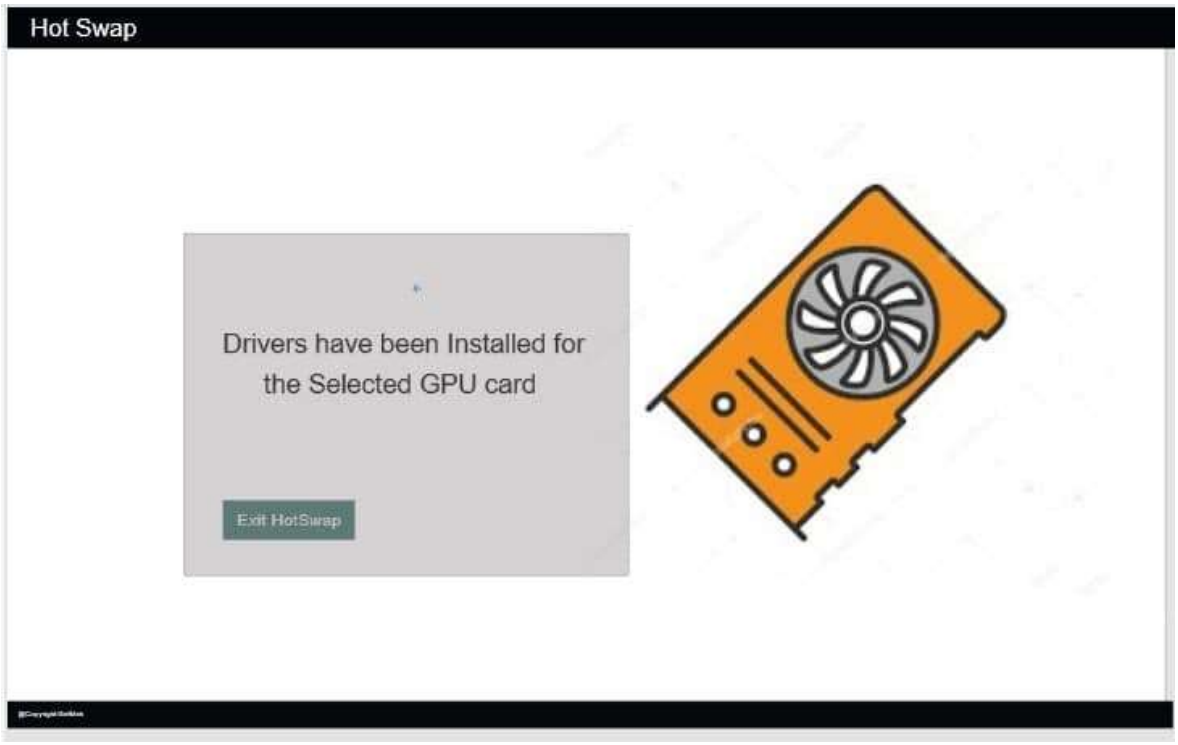
Designers or evaluators utilize the best arrangements found in the prototype stage to thoroughly test the product. This is the last period of the prototype phase, yet the outcomes delivered are regularly utilized in an iterative cycle. Testing is required for every product produced in order to check the quality and performance of the overall product. In our respective design thinking project under the topic of connecting external GPU to the computers to improve its performance, we did the testing too in 3 steps as follows:

Step 1: Connecting GPU dock with the computer.

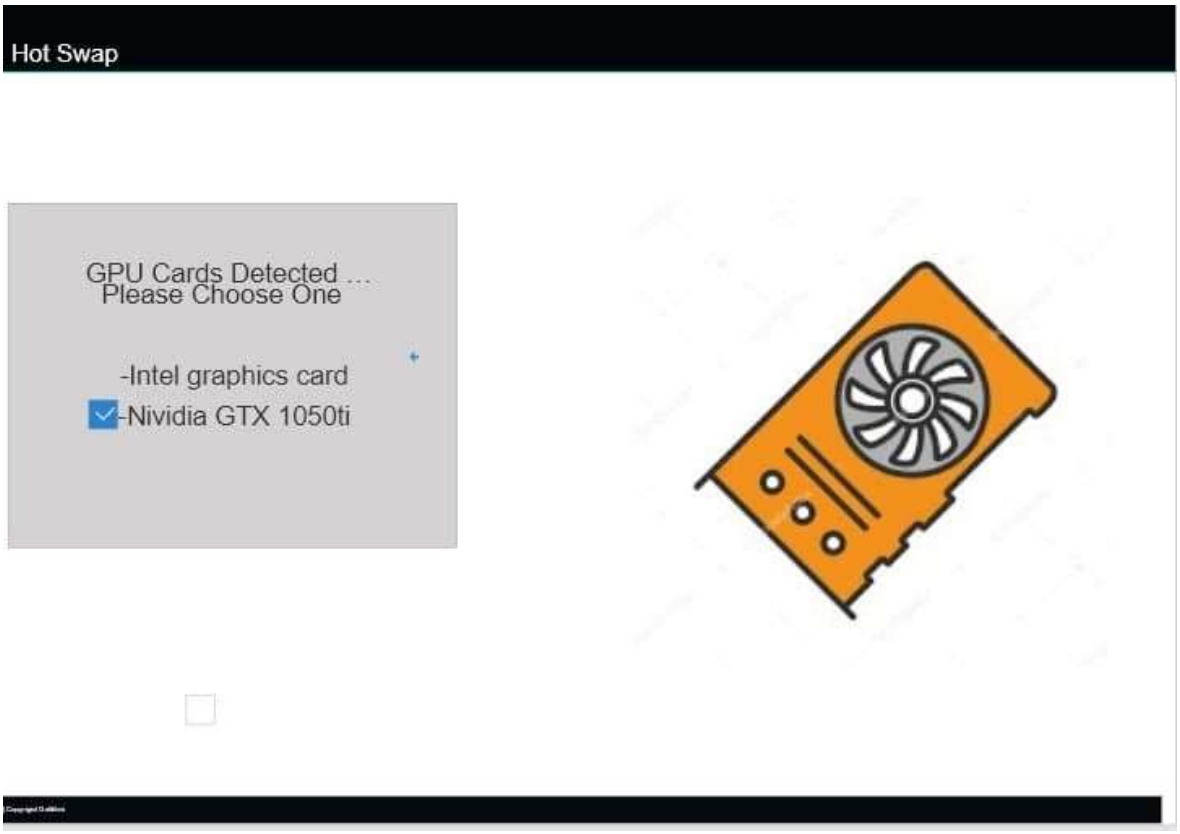


Step 2: Showing the message of new GPU detection on the Pc and asking the permission if we want to switch the GPU or not.

Step 3: After confirming that we want to switch, the driver installation message is portrayed.



Step 4: Finally, a success message is shown that the GPU card detected and we are given the option to choose one from the options.



MY REFLECTION

OMAR HAMED ABDELLATIF IBRAHIM (A18CS4061)

GPU is considered as a crucial part in our laptops and desktops during this design thinking process I was able to gather a lot of information regarding GPU cards and how each GPU card needs its own requirement from the CPU to be able to run efficiently I did a lot of research to be able come up with the GPU dock idea because I faced the lack of GPU power in my laptop before and I had to buy a desktop to solve the issue but for now we don't need to buy a desktop to use a powerful GPU ,adding on I was responsible for the idea generation in this process ,taking interview with the experts which helped me and my team to be able to think in a professional way I also came up with the prototype design and user interface design for the GPU dock I was also responsible for distributing tasks among my team to be able to work efficiently during this pandemic covid-19 ,off course me and my team we faced a hard time because we cannot meet in person due to the current MCO but with good team working and the presence of our lecturer Dr.Johana Binti Ah and her great support either with our questions or guiding us and together with communication application we were able to finish the report and the video ,finally this report helped me to think outside the box and be creative and figure a new problem we are facing instead of going with a common problem and overall I enjoyed to be part of this design thinking project.

TASK FOR EACH MEMBER

Team Member Name	Task Distribution
Omar hamed abdellatif ibrahim A18CS4061	• Report writing • Idea generation • Taking interview • Prototype design • Distributing tasks
Alaa Alrhman Mohammed Raweh AL-Shaibani A18CS4037	• Report writing • Designing UI • Build prototype • Recording video
Ali Hamed Abdellatif ibrahim A18CS4038	• Report Writing • Finding problems • Creating the dock connection • Proper Solutions
Mohammad Arsalan Mujaddadi	• Report writing • Finding problems • Video editing • Responsible for Communication
Khaled Ahmed Sedik	• Report writing • Gathering data & information • Creative Innovation • Organizing online sessions for the team

VIDEO LINK

https://www.youtube.com/watch?v=giTudszo7rA&ab_channel=MohammadArsalanMujaddadi