ENGG 525 Fall 2023

Assignment 3

Deadline: November 22, 2023 at 6:00pm

In the dynamic world of entrepreneurship, building and testing prototypes stand as a cornerstone of product development and innovation. Prototypes, tangible representations of your ideas, play a crucial role in validating and refining products before they reach the market. This assignment, centered around developing prototypes using Arduino kits, is designed to immerse you in the lean design thinking process—a methodology that emphasizes user-centric design, rapid prototyping, and iterative feedback. This hands-on experience will provide invaluable insights into the practical engineering design and build process.

You will work in your project teams to build a prototype for a problem of your choice. This could be the prototype for your project or a different problem. We want you to think about the design process, both individually and as a team. Do not just read the requirements and start building. Constantly think about what you are doing and why, and then document it.

You will be given a kit for your prototype, parts are shown in Appendix 'A', and you may make use of the 3D printers in the Schulich Maker Space. You are also allowed to use supplies beyond what we provide, however, they must be "recycled", i.e. you may not purchase anything new, but you may use materials that would otherwise be placed into the garbage or recycling bin.

You will be graded on:

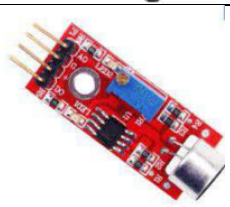
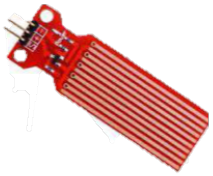
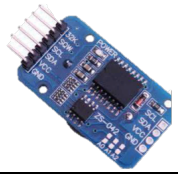
1. *Design Process*: Describe the steps taken to design and build the prototype, include any challenges that were encountered and how they were overcome. Your design plans can include sketches, tables, diagrams, and/or flowcharts.

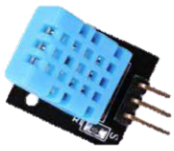
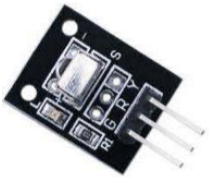
2. *Build Process*: Describe the steps taken to build the prototype, including Arduino programming, 3D printing, and other that are relevant to your build. Describe any difficulties that were encountered during the build process and how they were overcome.

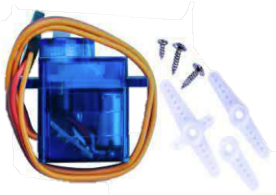
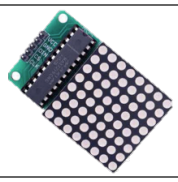
3. *Prototype*: Show the prototype and explain how it functions as per the design process. Test the prototype and iterate the build, if needed.

Submit a report including the problem you are solving with the proposed prototype, design plans, build and development stages, testing results, and performance. There is no page limit for the report. Only one submission per group. Bring your prototypes to the tutorial on November 22,2023.

APPENDIX A

Part	Input Device	Input	Output	Application Example
	GY-521 Module	Tilt & acceleration	Analogue	Game where you can control the tilt angles of a platform
	HC-SR501 Motion Sensor Module	Motion	Digital	Red light green light
	Sound Sensor Module	Sound	Analog	Louder sounds could make a character jump higher
	Water Level Detection Sensor Module	Water height	Analog	NA
	Ultrasonic Sensor	Distance from device	Analog	Flappy bird (in-class example)
	DS1307 RTC Module	Digital time	Digital	Day/night mode
	Rotary Encoder Module	Rotational movement	Analog	Translating rotation movement in linear movement of an object

	DHT11 Temperature and Humidity Module	Temperature and humidity	Digital	Game that responds to environmental conditions
	IR Receiver Module & Remote Control	Button press	Digital	Wireless controls
	Joystick Module	Two-axis movement	Analog	Walking or driving direction
	Potentiometer 10k	Rotational position	Analog	Setting a speed
	Membrane Switch Module	Button press	Digital	Wired controls
	Thermistor	Temperature	Analog	Game that responds to temperature
	Tilt Ball Switch	Position	Digital	Game aspect that only works when upside down
	Button	Button Press	Digital	Jump, walk, run, etc.
	Photoresistor (photocell)	Amount of light	Analog	Game that responds to light levels

Part	Output Device	Input	Output	Application Example
	LCD1602 Module	Digital	16 X 2 character display	Avoiding obstacles
	Servo Motor SG90	Analog	Rotation, angular position	Pointer on a strength meter
	Stepper Motor	Digital PWM	Variable speed rotation	Motor spins faster the closer you get to a goal
	MAX7219 Module	Digital	8 X 8 character display	Low level graphics display
	Seven Segment Display	Digital	Number display	Scoreboard, counting
	Active Buzzer	Digital	Single pitch sound	End of round buzzer
	Passive Buzzer	Analog	Variable pitch sound	Speaker
	Fan Blade & 3-6V Motor	Analog	Rotation	Motor spins when a goal is reached
	LEDs	Digital	Light turns on or off	Simon Says, scoreboard