College of Engineering

Department of Mechanical Engineering

Fall 2020-2021

Senior Design Project Report

Design of Reusable 3D Map Printing Using Robotic Arm and Moist Sand -

Team-06

Team Members

Student Name	Student ID
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Project Advisor:

Dr. Nassim Khaled

Abstract:

The project proposes a sustainable 3D display of maps. A robotic arm is used to mold moisture sand based on the 3D coordinates of the land. This allows 3D display of landscapes while using reusable material. The display also includes a projector that provides graphical texture to the 3D map.

Acknowledgments

Thank our Advisor, Dr. Nassim Khaled, for his brilliant Ideas and quick support for our project and his engagement throughout the project. Also, the help of our family financially and emotionally to overcome any hardness that was in our way.

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Chapter 1: Introduction

1.1 Project Definition

This project is about transforming 2D maps into 3D maps using robot Arm and programing. The Arm will be in a box, and it will mold a moldable material into the shape we command it to it. Then a mini projector will reflect a picture of an image into the 3d shape to show the 3d map we want.

1.2 Project Objectives

The main essential objectives in this project are:

1. Design a programable robot arm.
2. I am using a reusable moldable material.
3. Transforming 2D map to 3D map

1.3 Project Specifications

This project uses a Robot arm with the measurement shown in table 1.1. Moreover, the Arm will be in a glass box with a bracket to hold the mini projector.

Table 1.1: The system measurements

Item	Size
Arm Height	455mm
Arm base width	120mm
Arm base length	283mm
Glass box length	500mm
Glass box width	290mm
Glass box Hight	200mm

1.4 Applications

The main applications for the project are:

- To be used for demonstration of maps in a better and more innovative way.
- To give maps a more visual and more graphical appearance.

Chapter 2: Literature Review

2.1 Project background

Maps have become essential in our daily life. We use them every day and in all locations. We use google maps to know the way to any place. We use mall maps to see the site for the stores. Also, we use maps in budlings to see where the emergency exits or any urgent situation. This is not a new thing. In ancient times people often use maps to travel between countries. The evolution of maps is intriguing and exacting and will only keep evolving. The humans were constantly challenged to view and draw the best way to keep track of locations and maps, making that more accessible for them. It ensures that all the data are saved and viewed in the best way possible.

Figure 2.1 3D map display

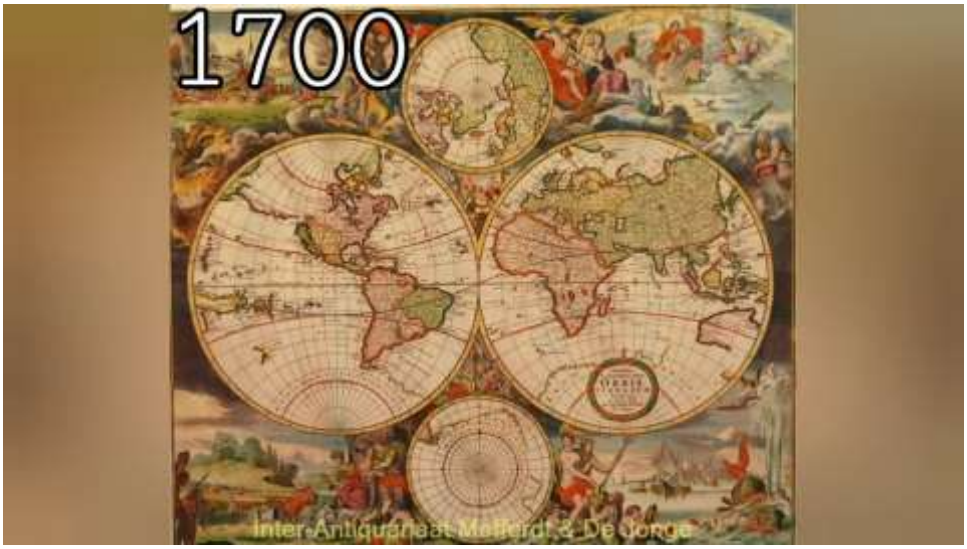

Figure 2.1: World Map from the 17th century

2.2 Previous Work

There is no previous work to work with from our idea. Converting a 2d map to 3d map using a robot arm and a mini projector is not what you find in research or daily life. The robot arm, however, is an excellent piece of technology. Many use it in diverse ways. For example, in medicine, they use them as assistance to help them in surgery. Pick up tool or more delicate parts that the human Arm cannot do it. They are even trying to use them in faraway surgery using the cloud and 5G to achieve their goal.

Medical Image Analysis (MedIA), Special Issue on Medical Robotics and Computer Assisted Surgery, Vol. 3(3), pp. 285-300, 1999.

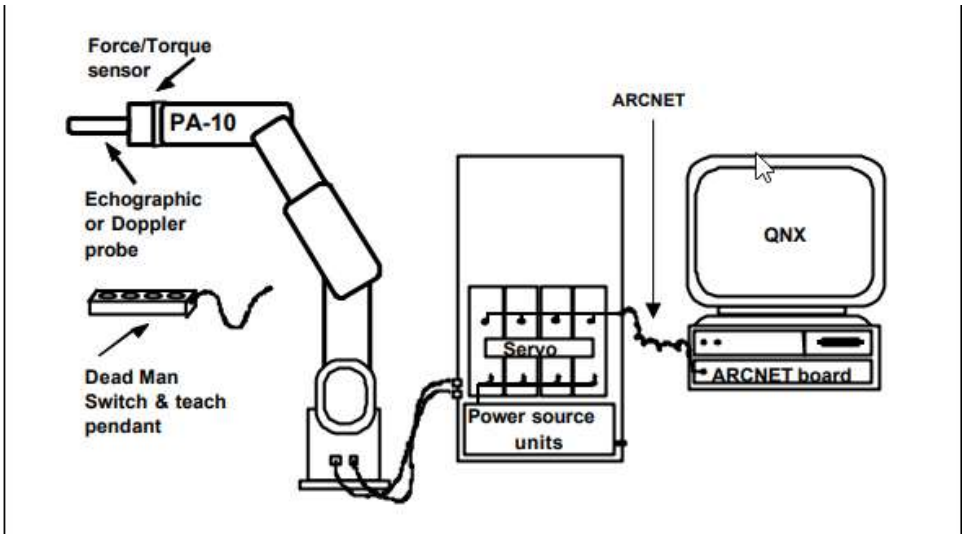

Figure 2.2. The system used for the feasibility study.

Figure 2.3. Test-bed for force control.

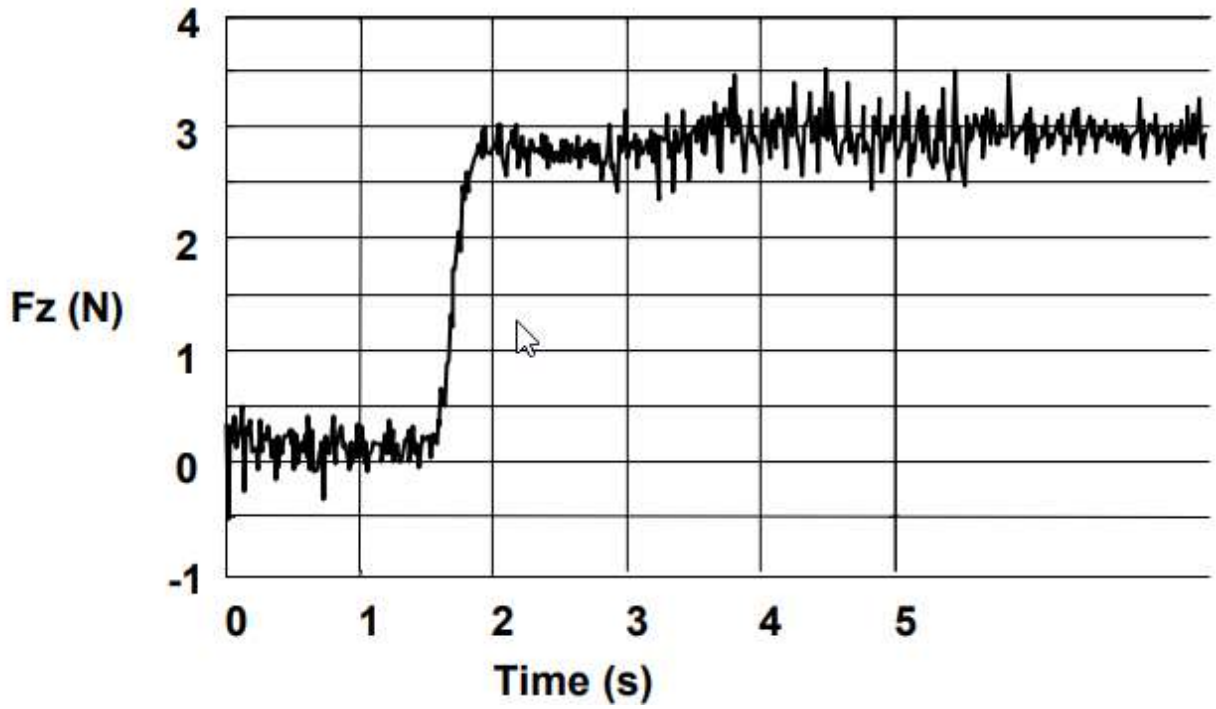

Figure 2.4. Force measurements. The probe moves first in "free space" and touches skin after one second. Then the desired force (3 N) is reached and kept constant. No filtering on measurements.

2.3 Comparative Study

Our project is unique. It is an innovative idea, and we want the people to see how amazing it is. The concept can be used to project a map in a unique setting. However, we are using pregaming apps like Arduino to make our idea into reality, which we will need people's knowledge to understand a program that we have little knowledge about. As mentioned before, we will also use a robotic arm developed and used much earlier, but uniquely. People usually use this Arm to pick up things and to place them somewhere according to their coordinates. Will, however, program this Arm to make it mold stuff that we commend it for doing it.

Chapter 3: System Design

3.1 Design Constraints and Design Methodology

3.1.1: Geometrical Constraints

There are many challenges that we had faced when we started our project. As with many tasks before us, lack of parts in the market makes us go to the online market. Moreover, the pandemic has played a vital role in getting the details we need in time. Our robot arm has been ordered from China, and the increasing security and costumes have delayed our shipment for about 21 days (about three weeks). Also, after we received it, the source of power for the Arm (which is the battery did not have enough ability to start the Arm. We took it upon ourselves and searched the local market to find a subtle battery. However, there was no suitable connection. Therefore, we bought a battery box and connected it through our system to make it work. Another challenge is the programming. It was not an easy task to program the Arm to our needing using the recommended app that came with the Arm was so challenging. The Arm will not respond until we make the perfect setting, which was a lot harder than imagining. After that, we move from the design to the other components. We select a good glass box to fit our molded material. Also, we designed a bracket and attached it to it to hold our mini projector in place.

3.1.2: Sustainability

Our biggest concern in terms of sustainability is our molded material. It may not hold elevated temperature and may get dry, which will make the structure that we build collapse. We used a material that will withstand a high temperature and sustain its shape for much longer to avoid the problem.

3.1.3: Environmental

Our project is very Environmental friendly. The material we use for 3d mapping is reusable, so each time we are done using our map, we can reuse the same material for another map.

3.1.4: Social

Our project is beneficial, especially in presentations. We can gather many people and show them an accurate simulation of the map for a place. The picture will stay in their memory far longer, and they will have a better imagination for the site we describe. They also can use for their good which is very impactful sociality.

3.1.5: Economic

Economically, our project could save money by allowing many users to access such devices, and by that, they can put their 2d maps into the project. It is converted into 3d one, so they will not need to 3d print a map every time they want to highlight a location in a map, which will save them a lot of money and time.

3.1.6: Safety

Our project runs on an eclectic battery, and the only safety concern is crush-type safety from the Robot arm while moving. It is not a big deal by any means and for anyone to work on it. We will be using a wireless controller to make him safe while the robot arm is moving.

3.1.7: Ethical

If new and innovative, our project could change how people look at maps differently yet effectively. The design is sleek and will use reusable material, which makes it suitable ethically.

3.1.8: risk factors

The risk factors of our project are already minimum, as mention in the safety topic. However, to minimize them even further, we make sure that the controllers for the project

are wireless, so we will not have to get close to the system while it is working. Also, we make sure that there is plenty of space between the Arm and the brackets that hold the projector so the Arm can work freely.

3.2 Engineering Design standards

We design our project to be in the engineering standards as much as possible. This section will look at the most critical component and look at each one of them. The selected features are the batteries, Digital servos, and the Bionic hand. Our battery standards have been accorded with UL standards. The digital servos Hi-Torque Coreless Standard. And the robot arm has been manufactured and design by hiwonder Hong Kong.

Table 3.2 Engineering standard

Components	**engineering Standard**	**details**
battery	UL	7.4V 1500 mAh lithium battery
digital servos	Hi-Torque Coreless	high torque, 180-degree precision rotate
Robot arm	hiwonder	455mm Hight, 283 length, 120 mm width, 1.2 KG weight

3.2.1: battery

Voltage: 7.4V

Capacity: 1500 MAH

Type: Lithium

3.2.2: digital servos

Four types have been used in the Arm

LD-1501MG servo: Used in the bottom, high torque, 180-degree precision rotation

Figure 3.2: LD-1501MG servo

LDX-218 servo: Used in the bottom joint, high torque, plugging-cable design, 180degree precision rotation.

Figure 3.3: LDX-218 servo

LFD-06 servo: Used in bottom joint, anti-blocking design to more extended service

Figure 3.4: LFD-06 servo

QDS-15 servo: Used in the palm, high torque, over-current protection

Figure 3.5: QDS-15 servo

3.2.3: Robot arm

We used a robot arm the has been manufactured and designed by hiwonder

Figure3.6: Robot Arm

3.3: Theory and Theoretical Calculations

3.3.1: Robot arm reach:

The robot arm distance d should reach all the corners of the glass box A, B, C, and D

So, the relation should be

A+d = B+d = C+d = D+d

3.3.2: Projector distance and scan area

The projector is a main part of the project, and it is distance should place at a height that will not interfere with the robot arms work. Also, the picture that projectile from the projector should cover the whole area of the glass box. To put it in theoretical perspective

Projectile picture = Box area

Box area = length * width

3.4 Product Subsystems and selection of Components

The figure below shows the parts of the project and how they should be assembled. The base that holds everything in place. The glass box will have the moldable material secured in the base and the scanner above the glass box, which will have a bracket to hold it in place. Lastly, the robot arm will be the main moving part of the project.

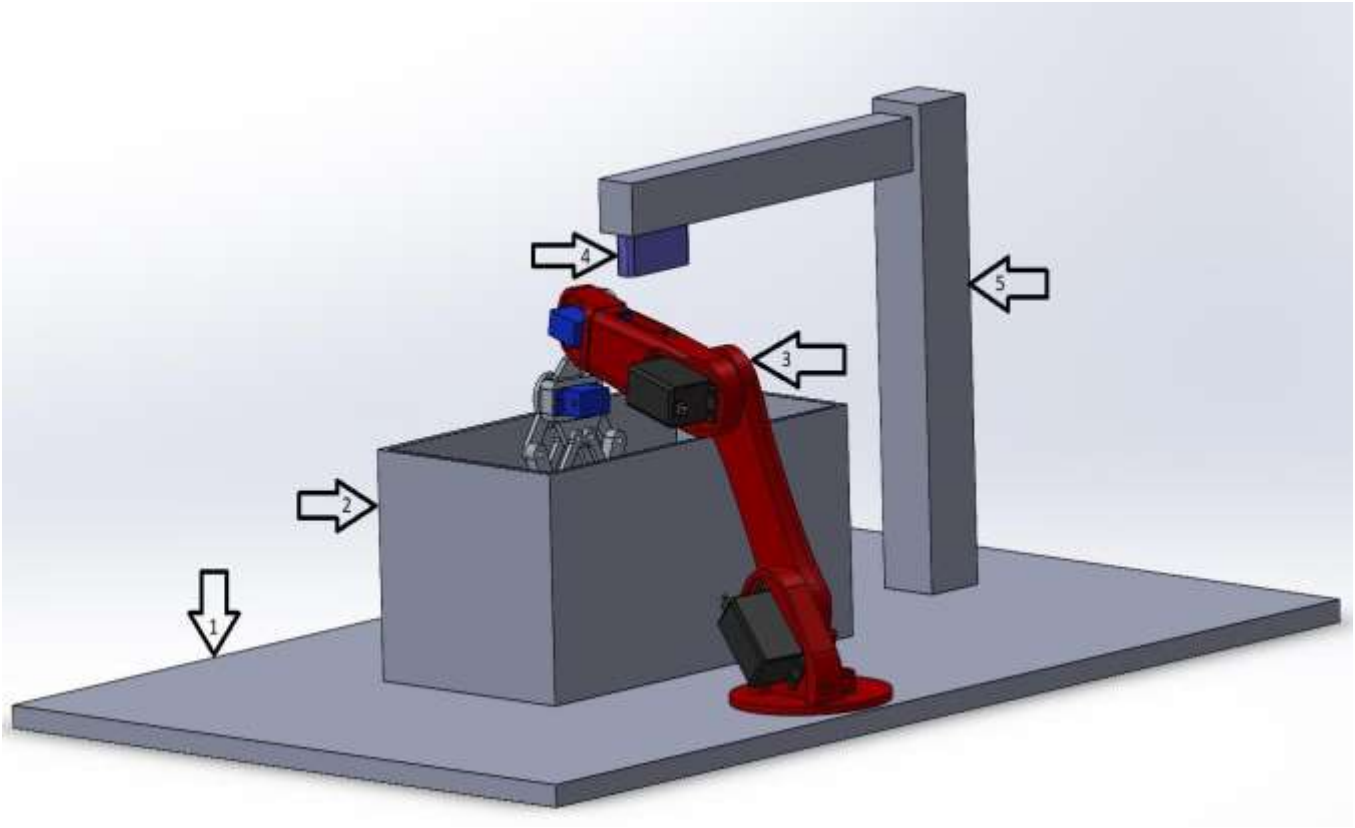

Figure 3.7: Assembly of the system

ITEM NO.	PART NAME	QTY.
1	Base	1
2	Glass box	1
3	Robot Arm	1
4	Projector	1
5	Bracket	1

3.5 Manufacturing and assembly (Implementation)

Our project consists of many parts that we assemble. Our 1st part is the base which is made from fine wood. The base is we will assemble all the parts on it. We choose wood because it is light and easy to drill and put screws on to secure the other parts. Our second main part is the tank. It is made from bioglass (A combination of glass and plastic). The tank will hold the moldable material in place, and it is where our Arm well shapes the map we need to show. The third main part is the robot arm. We will signal the robot arm and the robot arm to do the shape we asked for it. The 4th main part is the projector, which will be held above the tank. When the Arm finishes shaping the projector, its purpose is to show a figure of what we wanted to show.

Figure 3.8: Project base and the tank

Figure 3.9: Robot Arm

Figure 3.10: Projector

Chapter 4: System Testing and Analysis

4.1 Experimental Setup, Sensors and data acquisition system

4.1.1 Measuring Tape

In this part, We used Measuring tape to measure the distance between the projector and the surface of our moldable material where we would do our work. The 1st setup was to guess where the projector should be rough. Then, measure the distance. After that, we adjusted the projector's location until we got the correct length, measured the distance, and installed the projector in that location.

Specification:

- Maximum Measuring Distance : 3m/118in
- In, ft, mm, cm: Yes
- The material of the case is plastic
- Material of the tape fiberglass
- Package size: Plastic
- Package weight:300 m

Figure 4.1: Measuring Tape

Table 4.1: The testing parameters

Testing Parameters	**Objective**
Measuring tape	To measure the area and the circumference of the projector picture

4.2 Results, Analysis and Discussion

The table below will show all the testing we have done to get the picture in the correct size. We made sure that the projector is at the right height, so it covers all the box area

Hight of the projector (cm)	Covered area (length*width)
34	20 cm * 8 cm
50	35 cm * 15 cm*
70	50 cm*28 cm

Chapter 5: Project Management

5.1 Project Plan

The project consists of many parts, and our group worked hard to finish each one of them. The tasks were divided into each member. The table below tables below will show each lesson, the duration it took, and who finish them.

Table 5.1 Project Plan

#	Tasks		Start	End	Duration
1	Chapter 1: Introduction		14/2/2021	20/2/2021	6
2	Chapter 2: Literature Review	Project Background	21/2/2021	28/2/2021	7
		Previous work			
		Comparative study			
3	Chapter 3: System Design	Design Constraints and Design Methodology	28/2/2021	25/3/2021	26
		Engineering Design standards			
		Theory and Theoretical Calculations			
		Products Subsystem and selection of Components			
		Manufacturing and assembly			
4	Chapter 4: System Testing & Analysis	Experimental Setup, Sensors, and data	26/3/2021	8/4/2021	14
		Results, Analysis and Discussion			
		Project Plan			

5	Chapter 5: Project Management	Contribution of Team members Project Execution Monitoring Challenges & Decision Making Project Bill of Material & Budget	8/4/2021	16/4/2021	8
6	Chapter 6: Project Analysis	Life-Long Learning Impact of Engineering Solution Contemporary Issues Addressed	16/4/2021	22/4/2021	6
7	Chapter 7 : Conclusion & Recommendation	Conclusion Future Recommencation	22/4/2021	4/26/2021	4
8	Design of Prototype	Location Base Brackets	9/2/2021	15/2/2021	6
9	Parts Purchase	Robot Arm Fish box Mini-Projector	18/2/2021	13/3/2021	23

10	Assembly	Welding the brackets	15/3/2021	20/3/2021	5
		Assemble in base	21/3/2021	22/3/2021	1
11	Programming and Testing	Programming The Robot Arm	22/3/2021	4/21/2021	30
		Testing	4/21/2021	5/1/2021	11

Table 5.2 Taska And assigned members

#	Tasks	Assigned Members
1	Chapter 1: Introduction	Essam Badra
		Bander Ben Hareth
2	Chapter 2 : Literture Review	All
3	Chapter 3: System Design	All
4	Chapter 4 : System Testing & Analysis	Essam Badra
		Bander Bin Hareth
5	Chapter 5: Project Management	Qasim Alkhuridah
6	Chapter 6: Project Analysis	Essam Badra
		Bander Ben Hareth
7	Chapter 7 : Conclusion & Recommendation	All
8	Design of Prototype	Qasim Al-khuridah
9	Parts Purchase	Fadhel Al-Hassan
		Yusef Al-Otaibi
10	Assembly	QasimAlkhuridah
		Fadhel Al-Hassan
		Yusef Al-Otaibi
11	Programing and Testing	QasimAlkhuridah
		Fadhel Al-Hassan
		Yusef Al-Otaibi

5.2 Contribution of Team Members

Table 5.3 shows all the tasks and the contribution of all the group members.

#	Tasks		Assigned	Cont. %
1	Chapter 1: Introduction		Essam Badra	50%
			Bander Bin Hareth	50%
2	Chapter 2: Literature Review	Project Background	All	100%
		Previous work		
		Comparative study		
3	Chapter 3: System Design	Design Constraints and Design Methodology	All	100%
		Engineering Design standards		
		Theory and Theoretical Calculations		
		Products Subsystem and selection of Components		
		Manufacturing and assembly		
4	Chapter 4: System Testing & Analysis	Experimental Setup, Sensors, and data	Essam Badra	50%
		Results, Analysis and Discussion	Bander Bin Hareth	50%
		Project Plan		

5	Chapter 5: Project Management	Contribution of Team members	Qasim Alkhuridah	100%
		Project Execution Monitoring		
		Challenges & Decision		
		Making		
		Project Bill of Material & Budget		
6	Chapter 6: Project Analysis	Life-Long Learning	Essam Badra	50%
		Impact of Engineering Solution	Bander Bin Hareth	50%
		Contemporary Issues Addressed		
7	Chapter 7 : Conclusion & Recommendation	Conclusion	All	100%
		Future Recommencation		
8	Design of Prototype	Location	Qasim Al-khuridah	100%
		Base		
		Brackets		
9	Parts Purchase	Robot Arm	Fadhel Al-Hassan	50%
		Fish box	Yusef Al-Otaibi	50%
		Mini-Projector		

10	Assembly	Welding the brackets	Qasim Al-khuridah	33.3%
			Fadhel Al-Hassan	33.3%
			Yusef Al-Otaibi	33.3%
		Assemble in base	Qasim Al-khuridah	33.3%
			Fadhel Al-Hassan	33.3%
			Yusef Al-Otaibi	33.3%
11	Programming and Testing	Programming The Robot Arm	Qasim Al-khuridah	33.3%
			Fadhel Al-Hassan	33.3%
			Yusef Al-Otaibi	33.3%
		Testing	Qasim Al-khuridah	33.3%
			Fadhel Al-Hassan	33.3%
			Yusef Al-Otaibi	33.3%

5.3 Project Execution Monitoring

To improve our project, we had many activities to monitor and to have more ideas to help us get what we desire. In table 5.4 will show a list of these activities.

Table 5.4: Dates of the activities and events

Time/Date	**Activities/Events**
Weekly	Zoom meeting with group members
Biweekly	Meeting with group advisor
20th of March	Finishing Assembly
8th of April	Midterm presentation
15th of April	Finishing the prototype
19th of April	Testing the system
30th of April	Edit some scripts of the app for the system
5th of May	Finalizing the script
15th of May	Final Submission of the report
20th of May	Final presentation

5.4 Challenges and Decision Making

We had a lot of challenges in project making period, and the following will are the main challenges that we have faced so far :

- Delivery and missing parts problem
- Programing problem
- Getting the suitable modeling material
- Covid-19

5.4.1: Delivery and missing parts problem

In our project, We had to order several parts from outside the kingdom, and some of them are essential parts like the robot arm. However, due to covid-19 and the restricting travel, some features arrived late, making us wait for more to start working on the prototype. Also, some parts were missing when we received the delivery to go to a local shop to fabricate replacements.

5.4.2: Programming problem

After receiving the robot arm, we had to programing so it would do the modeling. However, the programing appeared to be so hard on us. We are no expert, so we had to learn the

robes. Also, the app is not accurate enough, and we had to adjust accordingly. We tried our best to make it work and have some results at the end of the prototype.

5.4.3: Getting the suitable molding material

One major issue that we had is getting the moldable material. We thought first of moist sand. But it does not hold for so long, so we bought magic sand for kids. However, the material was not soft enough for the hand to mold, so finally, we went for soft sand to get the best results.

5.4.4: Covid-19

Covid-19 has impacted our life in every way. We could not meet face to face and discuss the exact details of the project. We had to rely on pictures and online chat, which was not very reliable in many ways. Also, due to the restriction, some parts got delayed, and we had to wait for them to arrive to make the next move.

5.5 Project Bill of Materials and Budget

Table 5.5 will show all the material and the cost in Saudi Riyals (SR). The project has cost us to make

Table 5.5: Bill of materials

Materials	**Costs (SR)**
Base	150
Glass box	456
Brakets	250
Robot Arm	1500
Projector	1100
Moldable material	450
Total	**3906**

Chapter 6: Project Analysis

6.1 Life-long learning

We are working on a project that has reached us how to work as a team. It gives us the knowledge that each member of the team member is valuable, and we need to work together to achieve our final goal. Also, It teaches us that time is significant, and we have to set realistic goals and in a specific time frame. Moreover, It increased our communications skills with the outside world, we cannot do everything by ourselves, so it is ok to ask for help from experts.

6.1.1: Software skills:

In this project, we need a lot of software skills. Our most used programs are Word, Solidworks, and Robolab. Work was essential for writing our reports and recording every piece of information and data we got from the project. Solidworks gives a visual representation of what we will do and a glimpse of the final prototype. As for the main program, the robot lab was the main program to program our Arm and get it on the right track. This app was tricky, and we had to teach ourselves from the beginning. We had to watch the video and read manuals to get it running and then program it to work for our Arm. And finally, to adjust our Arm and make it move the way we want.

6.1.2: Hardware Skills

During the project period, We mainly use simple measuring tools. Most of our project was software-focused. However, we still learned from the shop that we used welding machines to fabricate our brackets and used a vise grip to bend the steel.

6.1.3: Time Management Skills

Time is an essential part of our daily lives, and this project has reached us to accurate with time even more. We had to promptly get our targets and manage our tasks to fit the time limit we had. We had to divide the tasks between our team members to use each second.

Also, in our weekly meeting, we always discussed where each member has got in his task, and if he need help or not, we are a team after all.

6.1.4: Project Management

The project is teamwork, and we divided our work from day one. Each member has their own set of tasks that we discuss weekly and set a new goal for the next week. Our teamwork in collaboration. Each one could take the task of the other if that member cannot do his task for any reason. Moreover, we try to help each other with ideas and new ways to solve the problems.

6.2 Impact of Engineering Solutions

Our project is an excellent example of a new and innovative idea that brings refreshing and creative ideas to the table.

6.2.1: Society

Our project could help the society knowing the shape of their memo geography of the land they live in. When they want to go somewhere or see how the ground looks, they could benefit from a 3d map that shows the details of the map they are searching for.

6.2.2: Economy

Our project has a reusable moldable material, so you will not need to use new materials each time you draw a map. Which very, very idle. This project was supposed to cost more than 5000 SR, but we got it down to less than 4000 SR through some manging.

6.2.3: Environment

Our project is clean for the environment. We use natural sand for our map drawing, which has no pollution. Our project has no emissions and no noise. It is very safe and clean.

Chapter 7: Conclusion and Future Recommendations

7.1 Conclusion

This project has helped us learn many valuable things in our productive and everyday life.

It improves our communication with expert people, and we are better at listening and understanding their recommendations. Also, It taught us not to give up even if we faced a blocked road. We have to find a solution and learn to adapt to your situation. When it comes to our project, we know many valuable skills. Thanks to our helpful courses in the university. Such as CAD Design of mechanism and statics. All these projects helped us build our project. We faced so many programing problems and tried our best to have it there to understand our idea.

7.2 Future Recommendations

The project is nowhere perfect. However, it lay the foundation for future improvement. That will take this idea to a splendid future. Some ideas could be implemented to improve the project. A better and more specialized arm for molding would make it easier to work on the system. Also, A softer and sturdier material should do the trick on creating better shapes. A shorter box will make it easier to try various materials. Also, having a member that is well informed in coding and software should give you plenty of understanding of how apps like Arduino works.

8. References

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Appendix A: Progress Reports

	SDP – Monthly MEETING REPORT
	Department of Electrical Engineering **Prince Mohammad bin Fahd University**

SEMESTER:	Spring	**ACADEMIC YEAR:**	2020/2021
PROJECT TITLE	Design of Reusable 3D Map Printing Using Robotic Arm and Moist Sand		
SUPERVISORS	Dr. Nassim Khaled		

Month : March

ID Number	Member Name
201403512	Qasim Al-Khuridah
201602426	Fadhel Alhassan
201200099	Yousef Al-otaib
201203026	Bandar Mahdi Balhareth
201500792	Essam Badra

List the tasks conducted this month and the team member assigned to conduct these tasks

#	Task description	Team member assigned	Progress 0%-100%	Delivery proof
1	Programing, designing and communicating with the supervisor	asim Al-Khuridah	90%	
2	purchasing parts	Fadhel Alhassan	100%	
3	Arrangement and Assembly	Yousef Al-otaib	85%	
4	Report's writing	Bandar Mahdi Balhareth and Essam Badra	85%	

List the tasks planned for March and the team member/s assigned to conduct these tasks

#	Task description	Team member/s assigned

1	Programing, designing, and communicating with the supervisor	Qasim Al-Khuridah
2	helping with Programing and designing	Fadhel Alhassan
3	Arrangement and Assembly	Yousef Al-otaib
4	Reports writing	Bandar Mahdi Balhareth
5	Reports writing	Essam Badra

- **To be Filled by Project Supervisor and team leader:**
- **Please have your supervisor fill according to the criteria shown below**

Outcome MEEN4:				
an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts				
Criteria	**None (1)**	**Low (2)**	**Moderate (3)**	**High (4)**
MEEN4A. Demonstrate an understanding of engineering professional and ethical standards and their impact on engineering solutions in a global, economic, environmental, and societal context	Fails to demonstrate an understanding of engineering professional and ethical standards and their impact on engineering solutions in global, economic, environmental, and societal contexts	Shows limited and less than adequate understanding of engineering professional and ethical standards and their impact on engineering solutions in global, economic, environmental, and societal contexts	Demonstrates satisfactory understanding of engineering professional and ethical standards and their impact on engineering solutions in global, economic, environmental, and societal contexts	Understands appropriately and accurately the engineering professional and ethical standards and their impact on engineering solutions in global, economic, environmental, and societal contexts
Outcome MEEN5:				
an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives				
Criteria	**None (1)**	**Low (2)**	**Moderate (3)**	**High (4)**

MEEN5A: Ability to develop teamwork plans and allocate resources and tasks	Fails to develop teamwork plans and allocate resources and tasks	Shows limited and less than adequate ability to build teamwork plans and allocate resources and tasks	Demonstrates satisfactory ability to develop team work plans and allocate resources and tasks	Properly and efficently makes team work plans and allocate resources and tasks
MEEN5B: Ability to participate and function effectively in team work projects to meet objectives	Fails to participate and function effectively in team work projects to meet objectives	Shows limited and less than adequate ability to participate and function effectively in team work projects to meet objectives	Demonstrates satisfactory ability to participate and function effectively in team work projects to meet objectives	Function effectively in team work projects to meet objectives
MEEN5C: Ability to communicate effectively with team members	Fails to communicate effectively with team members	Shows limited and less than adequate ability to communicate effectively with team members	Demonstrates satisfactory ability to communicate effectively with team members	Communicates properly and effectively with team members

Indicate the extent to which you agree with the above statement, using a scale of 1-4 (1=None; 2=Low; 3=Moderate; 4=High)

#	Name	Criteria (MEEN4A)	Criteria (MEEN5A)	Criteria (MEEN5B)	Criteria (MEEN5C)
1	Qasim Al-Khuridah	4	4	4	4
2	Fadhel Alhassan	4	4	4	4
3	Yousef Al-otaib	4	4	4	4
4	Bandar Mahdi Balhareth	4	4	4	4
5	Essam Badra	4	4	4	4

	SDP – WEEKLY MEETING REPORT
	Department of Electrical Engineering **Prince Mohammad bin Fahd University**

SEMESTER:	Spring	**ACADEMIC YEAR:**	2020/2021
PROJECT TITLE	Design of Reusable 3D Map Printing Using Robotic Arm and Moist Sand		
SUPERVISORS	Dr. Nassim Khaled		

Month : April

ID Number	Member Name
201403512	Qasim Al-Khuridah
201602426	Fadhel Alhassan
201203026	Yousef Al-otaib
201500792	Bandar Mahdi Balhareth
201200099	Essam Badra

List the tasks conducted this month and the team member assigned to conduct these tasks

#	Task description	Team member assigned	Progress 0%-100%	Delivery proof
1	Programing, designing, and communicating with the supervisor	Qasim Alkhuridah	95%	
2	Arrangement and Assembly	Fadhel Alhassan Yousef Al-otaib	100%	
3	Report's writing	Bandar Mahdi Balhareth Essam Badra	90%	

List the tasks planned for the month of March and the team member/s assigned to conduct these tasks

#	Task description	Team member/s assigned
1	Programing, designing, and communicating with the supervisor	Qasim Al-Khuridah
2	helping with Programing and designing	Fadhel Alhassan Yousef Al-otaib

3	Reports writing	Bandar Mahdi Balhareth Essam Badra

- **To be Filled by Project Supervisor and team leader:**
- **Please have your supervisor fill according to the criteria shown below**

Outcome MEEN4: an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts				
Criteria	**None (1)**	**Low (2)**	**Moderate (3)**	**High (4)**
MEEN4A. Demonstrate an understanding of engineering professional and ethical standards and their impact on engineering solutions in global, economic, environmental and societal context	Fails to demonstrate an understanding of engineering professional and ethical standards and their impact on engineering solutions in global, economic, environmental, and societal contexts	Shows limited and less than adequate understanding of engineering professional and ethical standards and their impact on engineering solutions in global, economic, environmental, and societal contexts	Demonstrates satisfactory understanding of engineering professional and ethical standards and their impact on engineering solutions in global, economic, environmental, and societal contexts	Understands appropriately and accurately the engineering professional and ethical standards and their impact on engineering solutions in global, economic, environmental, and societal contexts

Outcome MEEN5: an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives				
Criteria	**None (1)**	**Low (2)**	**Moderate (3)**	**High (4)**
MEEN5A: Ability to develop team work plans and allocate	Fails to develop team work plans and allocate resources and tasks	Shows limited and less than adequate ability to develop team work plans	Demonstrates satisfactory ability to develop team work plans and allocate	Properly and efficently makes team work plans and allocate resources and tasks

resources and tasks		and allocate resources and tasks	resources and tasks	
MEEN5B: Ability to participate and function effectively in team work projects to meet objectives	Fails to participate and function effectively in team work projects to meet objectives	Shows limited and less than adequate ability to participate and function effectively in team work projects to meet objectives	Demonstrates satisfactory ability to participate and function effectively in team work projects to meet objectives	Function effectively in team work projects to meet objectives
MEEN5C: Ability to communicate effectively with team members	Fails to communicate effectively with team members	Shows limited and less than adequate ability to communicate effectively with team members	Demonstrates satisfactory ability to communicate effectively with team members	Communicates properly and effectively with team members

Indicate the extent to which you agree with the above statement, using a scale of 1-4 (1=None; 2=Low; 3=Moderate; 4=High)

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3	Yousef Al-otaib	4	4	4	4
4	Bandar Mahdi Balhareth	4	4	4	4
5	Essam Badra	4	4	4	4

	SDP – WEEKLY MEETING REPORT
	Department of Electrical Engineering **Prince Mohammad bin Fahd University**

SEMESTER:	Spring	**ACADEMIC YEAR:**	2020/2021
PROJECT TITLE	Design of Reusable 3D Map Printing Using Robotic Arm and Moist Sand		
SUPERVISORS	Dr. Nassim Khaled		

Month : May

ID Number	Member Name
201403512	Qasim Al-Khuridah
201602426	Fadhel Alhassan
201203026	Yousef Al-otaib
201500792	Bandar Mahdi Balhareth
201200099	Essam Badra

List the tasks conducted this month and the team member assigned to conduct these tasks

#	Task description	Team member assigned	Progress 0%-100%	Delivery proof
1	Programing, designing, and communicating with the supervisor	Qasim Alkhuridah	95%	
2	Arrangement and Assembly	Fadhel Alhassan Yousef Al-otaib	100%	
3	Report's writing	Bandar Mahdi Balhareth Essam Badra	100%	

List the tasks planned for the month of may and the team member/s assigned to conduct these tasks

#	Task description	Team member/s assigned
1		
2		

3		

- **To be Filled by Project Supervisor and team leader:**
- **Please have your supervisor fill according to the criteria shown below**

Outcome MEEN4: an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts				
Criteria	**None (1)**	**Low (2)**	**Moderate (3)**	**High (4)**
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Outcome MEEN5: an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives				
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resources and tasks		and allocate resources and tasks	resources and tasks	
MEEN5B: Ability to participate and function effectively in team work projects to meet objectives	Fails to participate and function effectively in team work projects to meet objectives	Shows limited and less than adequate ability to participate and function effectively in team work projects to meet objectives	Demonstrates satisfactory ability to participate and function effectively in team work projects to meet objectives	Function effectively in team work projects to meet objectives
MEEN5C: Ability to communicate effectively with team members	Fails to communicate effectively with team members	Shows limited and less than adequate ability to communicate effectively with team members	Demonstrates satisfactory ability to communicate effectively with team members	Communicates properly and effectively with team members

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2	Fadhel Alhassan	4	4	4	4
3	Yousef Al-otaib	4	4	4	4
4	Bandar Mahdi Balhareth	4	4	4	4
5	Essam Badra	4	4	4	4

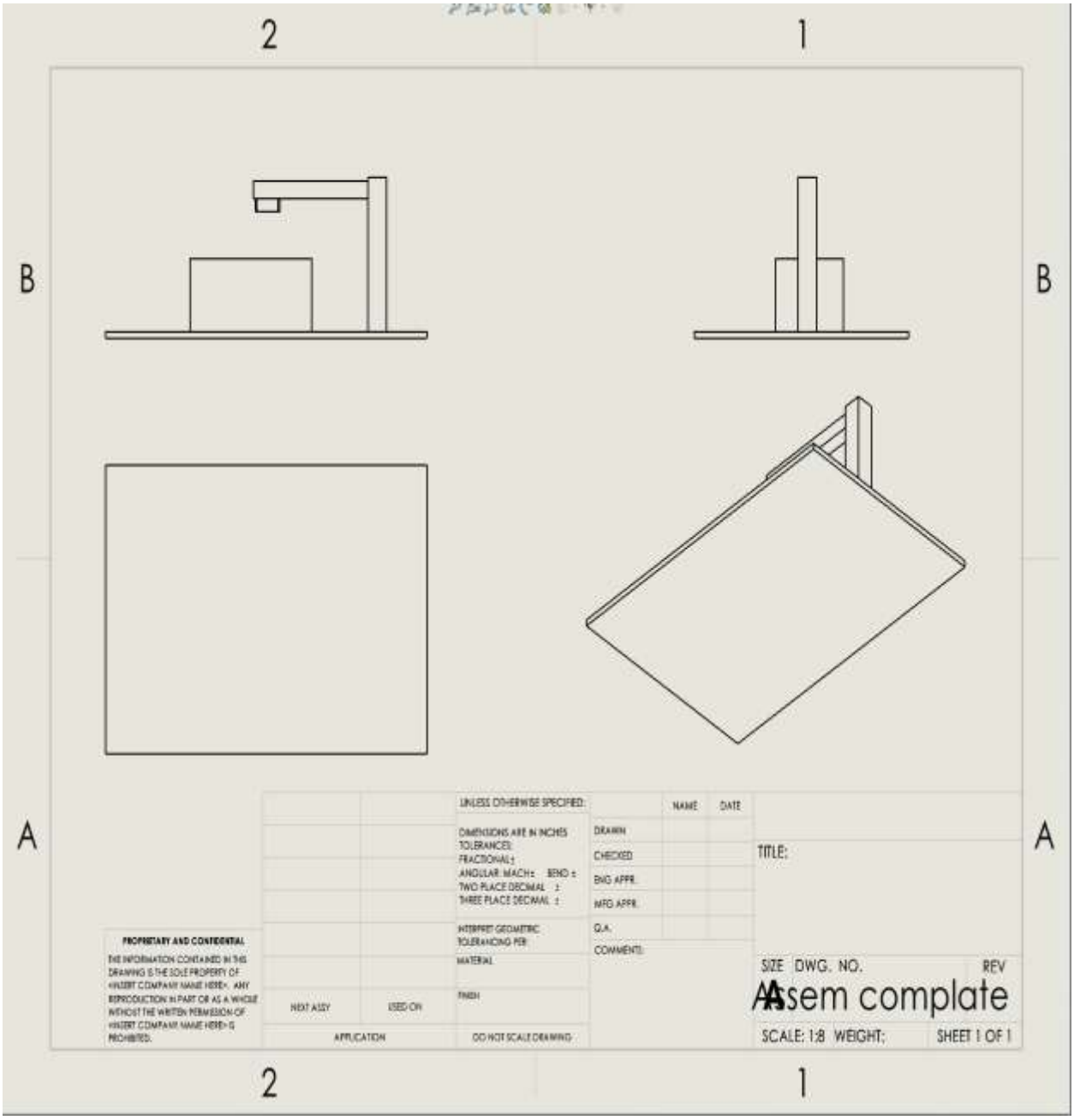
Comments on individual members

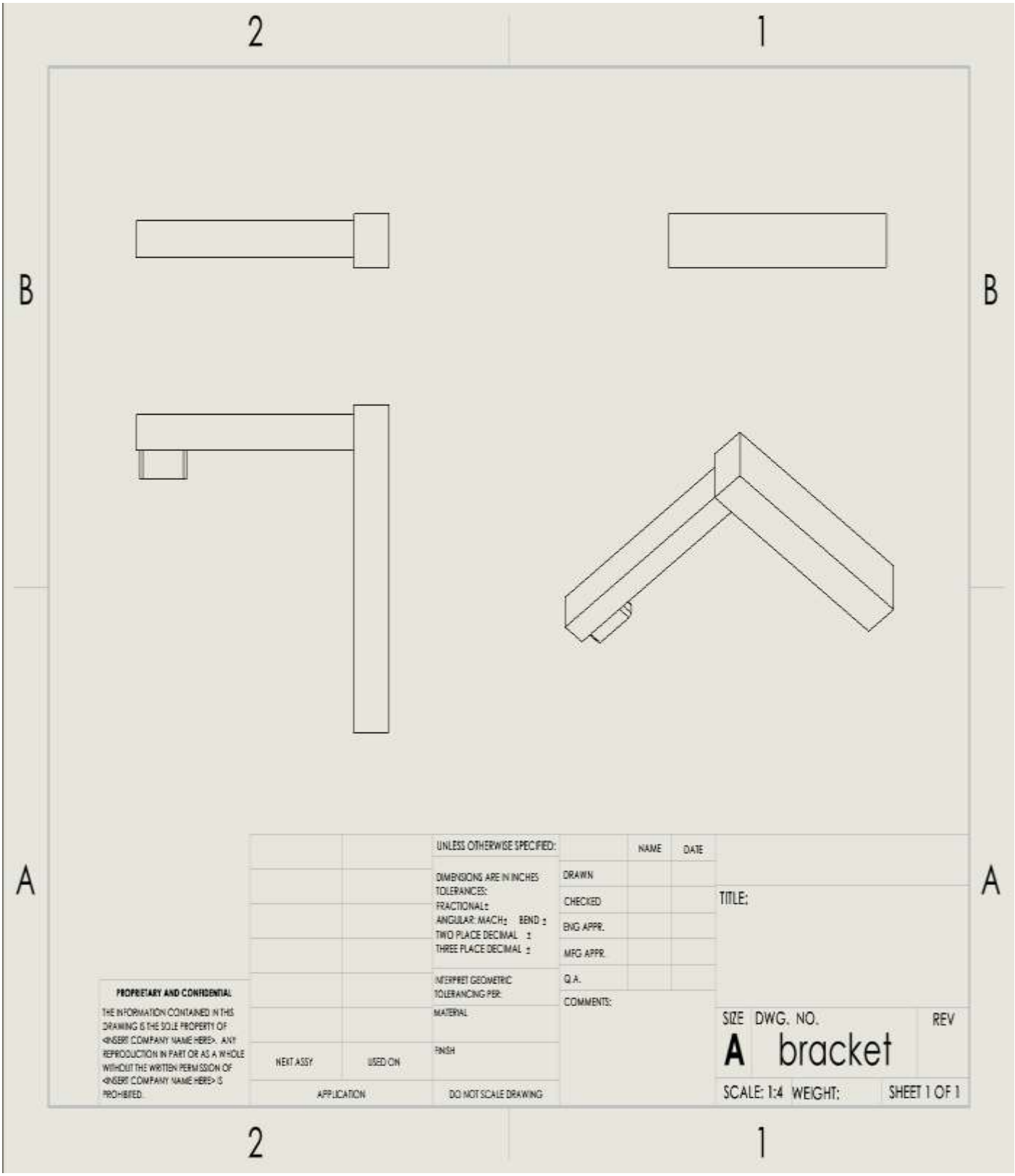
Name	Comments

Appendix B: Engineering standards (Local and International)

Components	engineering Standard	details
battery	UL	7.4V 1500 mAh lithium battery
digital servos	Hi-Torque Coreless	high torque, 180-degree precision rotate
Robot arm	hiwonder	455mm Hight, 283 length, 120 mm width, 1.2 KG weight

Appendix C: CAD drawings and Bill of Materials

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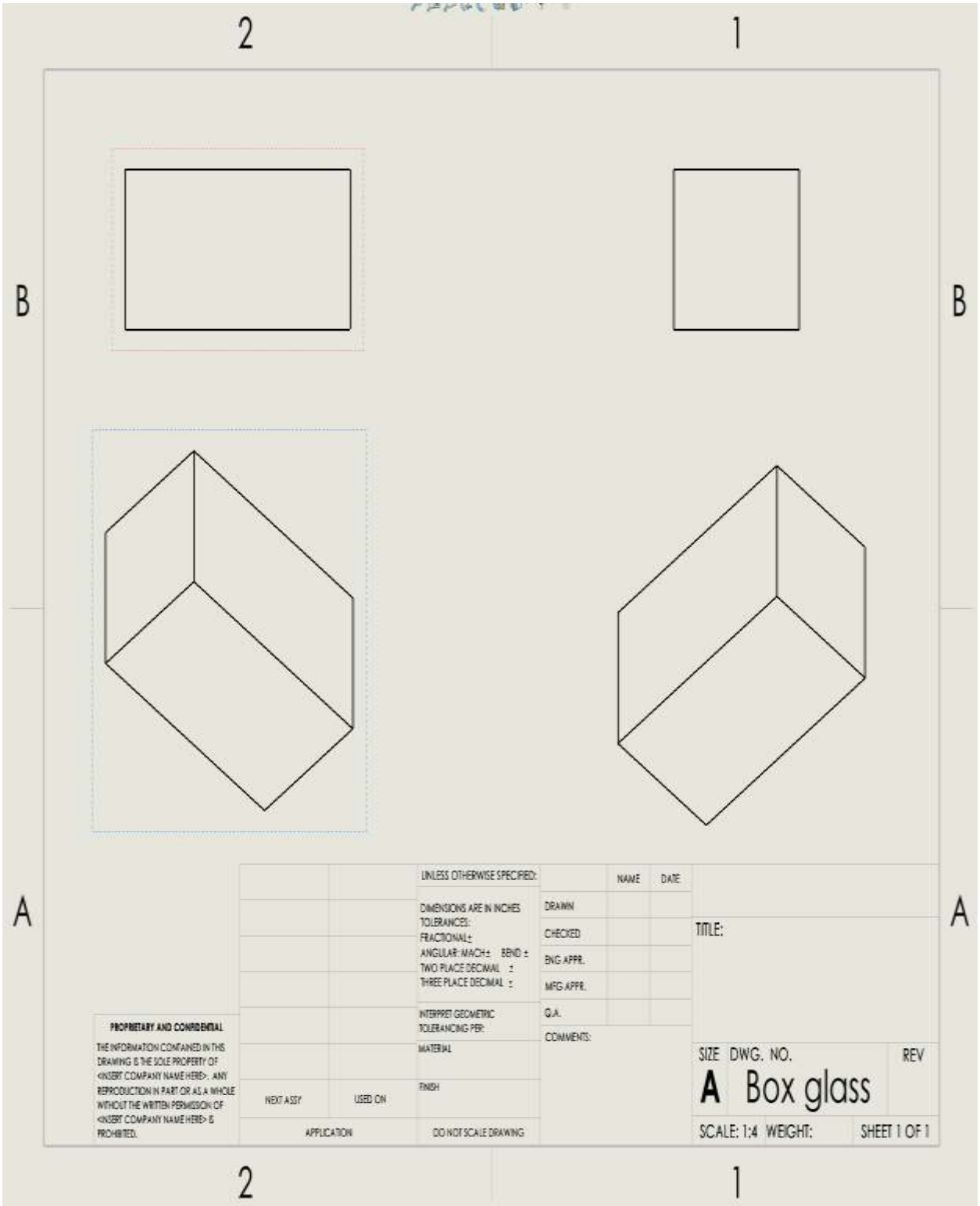
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Appendix E: Operation Manual

To Run the project :

1. Make sure the Arm is in the correct position.
2. Put the information that you need in the LABROBO program.
3. Startup the Arm from the menu.
4. Turn on the projector.
5. Select the map that you want to show.

Appendix F: Gantt Chart

Team-06 Design of Reusable 3D Map Printing Using Robotic Arm and Moist Sand

Team 6

Task 1	**Start Date**	**Days to complete**
Identify the scope of the project.	31/01/2021	10
Determine objectives		
Divide tasks		
Perform literature search		
Task 2		10
Order the Robot Arm	11/02/2021	
Report cover page, Abstract, Acknowledgment, table of contents,	19/2/2021	
find a good program app	20/02/2021	
Assemble The arm	21/02/2021	5
Find a Suitable Container	26/02/2021	5
Find suitable reusable materials	02/03/2021	5
prepare for midterm	07/03/2021	5
Task 3		
Taking the Calculations of:	12/03/2021	20
Container		
Railway		
Midterm presentation		
Task 4		
Assemble the prototype	1//4/2021	10
Prototype compilation		10
Correct any mistake that you may find		5
Finalize all the paperwork related to the project		5
Make a poster		3
Task 5		
Present your final project	19/5/2021	2