GUJARAT TECHNOLOGICAL UNIVERSITY

CHANDKHEDA, AHMEDABAD
AFFILIATED

G. H. PATEL COLLEGE OF ENGINEERING & TECHNOLOGY

A Project on
"MOTION CLONING"
(User Defined Project)

Under the subject of

PROJECT-I (2170001)
B.E. IV, Semester – VII
MECHATRONICS

TEAM ID: 66117

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ACADEMIC YEAR: 2019-2020

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ACKNOWLEDGEMENT

We appreciate **GTU** for giving us a platform, which can transform our idea into a design or any product, which can help people in their day-to-day life.

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COLLEGE CERTIFICATE

Date:

This is to certify that the project entitled "MOTION CLONING" has been carried out by SAGAR DESAI (160110120008), JASH SACHDEV (160110120052), MAHARSHI THAKRAR (160110120059) and NISARG UPADHYAY (160110120060) under our guidance in fulfilment for the degree of Bachelor of Engineering (7th Semester) of Gujarat Technological University, Ahmedabad during the Academic year 2019-20.

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We hereby certify that we are the sole authors of this UDP project report and that neither any part of this UDP project report nor the whole of the UDP Project report has been submitted for a degree by other student(s) to any other University or Institution.

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Prof. Umang Jani
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ABSTRACT

There are many places where it requires human precision and accuracy but those places and environments are sometimes inaccessible and risky to human health. There are technologies which are used to mimic the human motion for such kinds of jobs. For the motion to replicate, the operator has to wear some kind of hardware on his body part whose motion is then transferred to the mechanical body part. Here we want to make the same application without any hardware interaction between the operator and device that controls the robotic hand for various application. We are trying to create the motion with the help of the camera or a sensor where the operator just has to do the motion in the space, that motion is then captured by the camera. And from the change in the pixel distance between the predesignated nodes in real time and space from every frame, that distance is then converted in the mechanical motion with precision.

1- INTRODUCTION

A. ADDITIVE MANUFACTURING

1. 3D Printing

ADDITIVE MANUFACTURING

In this type method, material is added (extruded) to produce a part.

The **3D Printing** method used here is FDM (Fused Deposition Modelling) wherein a filament made up of ABS/PLA is heated to melt the filament and is then deposited layer by layer at a time.

1.1 Problem Summary

Engineers, who make projects for their curricular as well as for their own learning purposes, usually divide their work in 3 stages i.e. **Designing, Manufacturing Parts & Assembling Parts.**

The first stage is easy as the student himself is designing the project & thus can do it according to his/her requirement. The next stage i.e. **manufacturing the parts.**

Here is where the problem arises as students do not have access to the different machines with different capabilities for their needs, nor do they have enough money to invest in so much costly machines & space to keep those machines. Outsourcing the machining of parts is also too costly.

Thus, what the students do is either compromise their design or use traditional methods to make their parts, which results in poor quality of parts, decreases the accuracy of parts& also consumes hours of tedious hard work.

This problem not only applies for engineers, but also to:

- Architecture students for making their models

- Small scale Industries to make & design new products
- Hobbyists creating innovative projects

1.2 Aim & Objective

AIM: To mimic the motion of a human hand in a robotic hand without any direct hardware contact.

OBJECTIVES:

- Portability
- Should be accurate and precise
- Cost effective compared to other available
- Minimum hardware requirement

1.3 Outcomes of the project

- After the completion of the project, the part can be used in following ways:

1. It can be used in Military operations.
2. In Industries.
3. Places where Humans cannot have access but requires their personal experience.
4. Can be used in applications of Augmented Reality.
5. If modified further, it can be used in Hospitals for Surgeries.

1.4 Scope of Future Work

If Camera can detect precise human body movements with real time without any lag in transmission of the data then it can interact with the far situated humanoid robotic body and can be applied at the places where humans can't reach or their bodies aren't suitable in the environment.

1.5 Working Principle

The Camera with proper edge detection algorithm to find the pixel distance between predefined nodes that can replicate the motion in real time and space due to the change in pixel distance in a particular direction.

When pixel distance will get changed between 2 nodes it gives an output between both x-y coordinates using Euclidean or Manhattan distance, it gives us a particular value that specify distance according to our predefined resolution grid.

This data which is in the form of distance vector from a particular point is converted in an angular form for rotation of the servo motor.

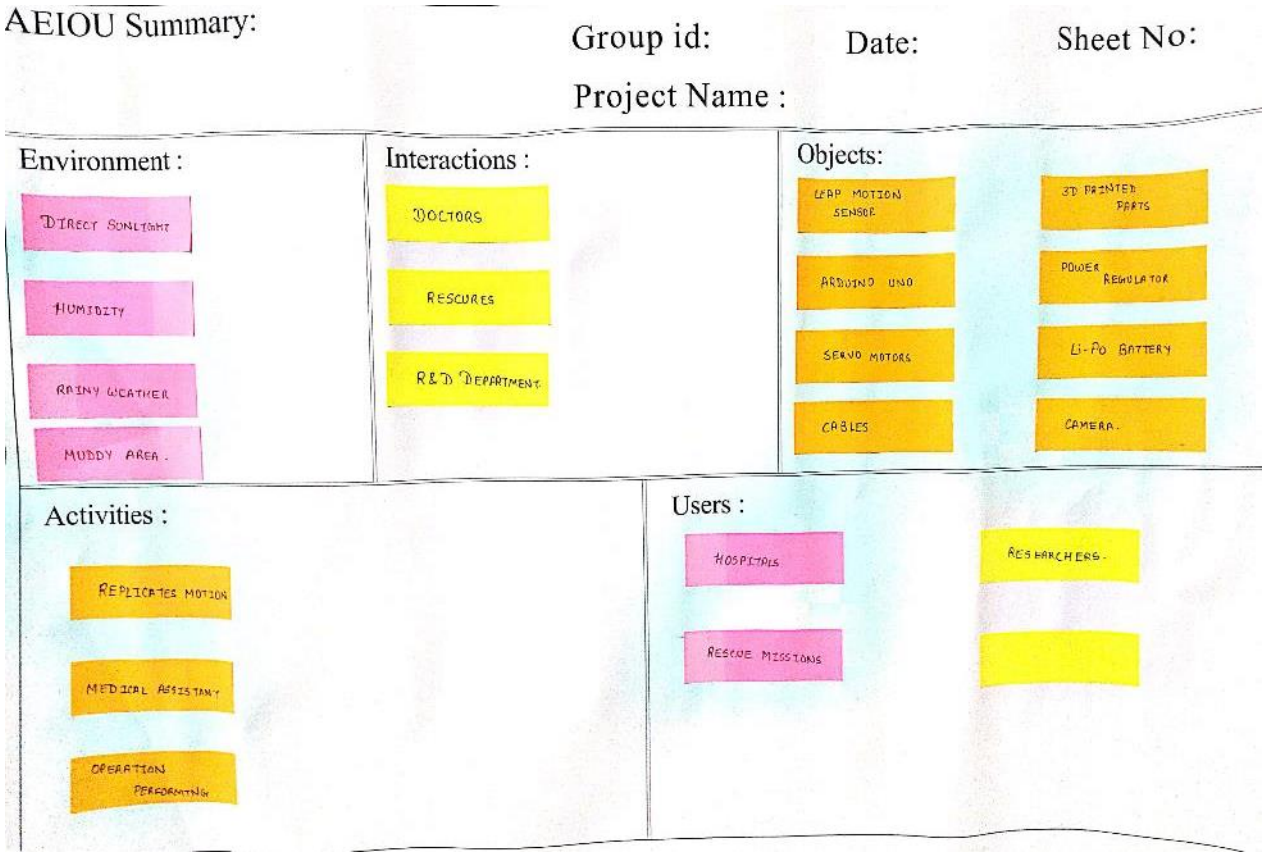
1.6 Materials / Tools required

Product	Quantity
Arduino Uno	1
Leap Motion	1
MG995r Servo	7
Braided fishing line	5 m
Dark Black PLA	4 Kg.
Bolts and Nuts	-
Drill and finishing kit	1
Servo Board controller	1

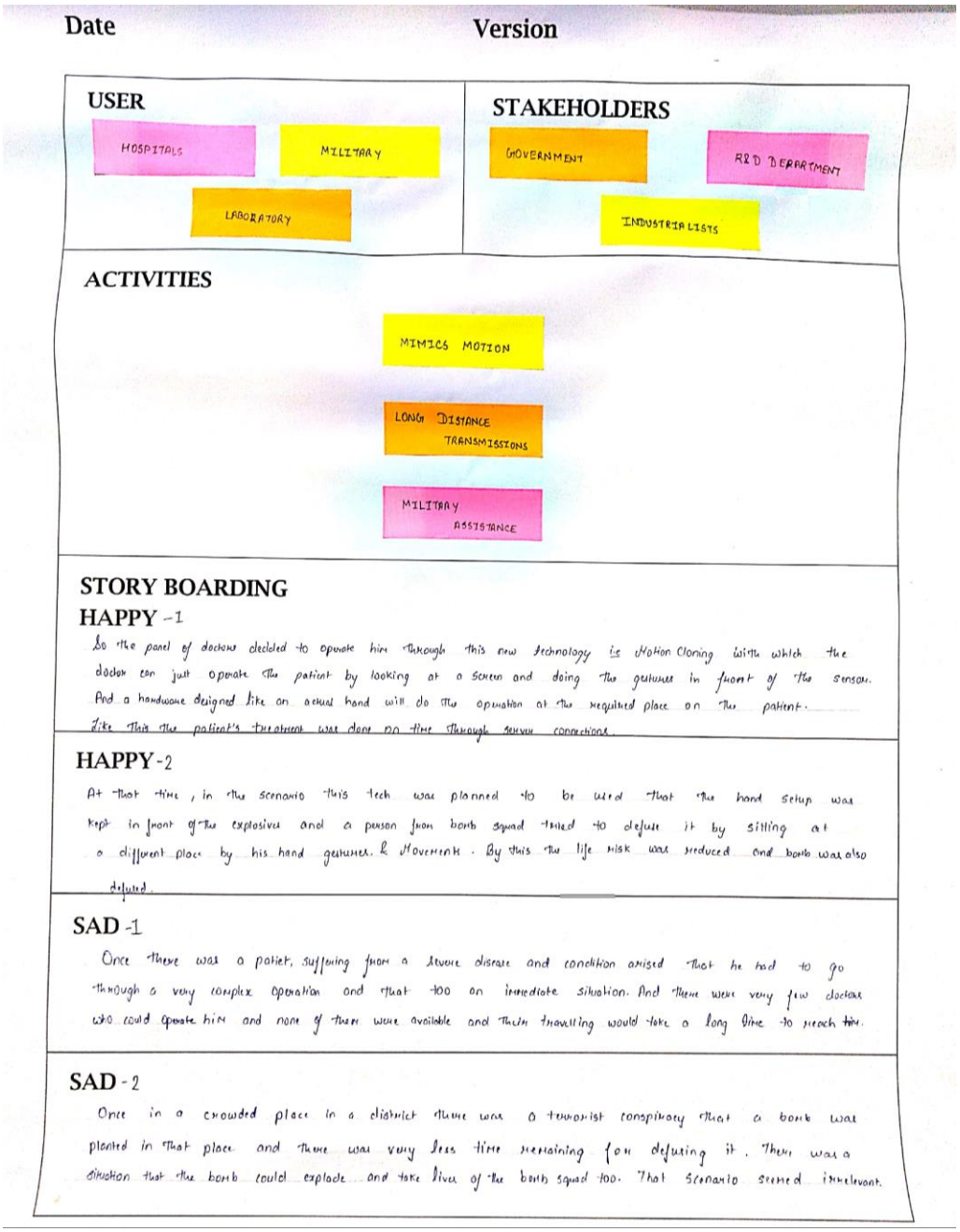
2

DESIGN: ANALYSIS, DESIGN METHODOLOGY AND IMPLEMENTATION STRATEGY

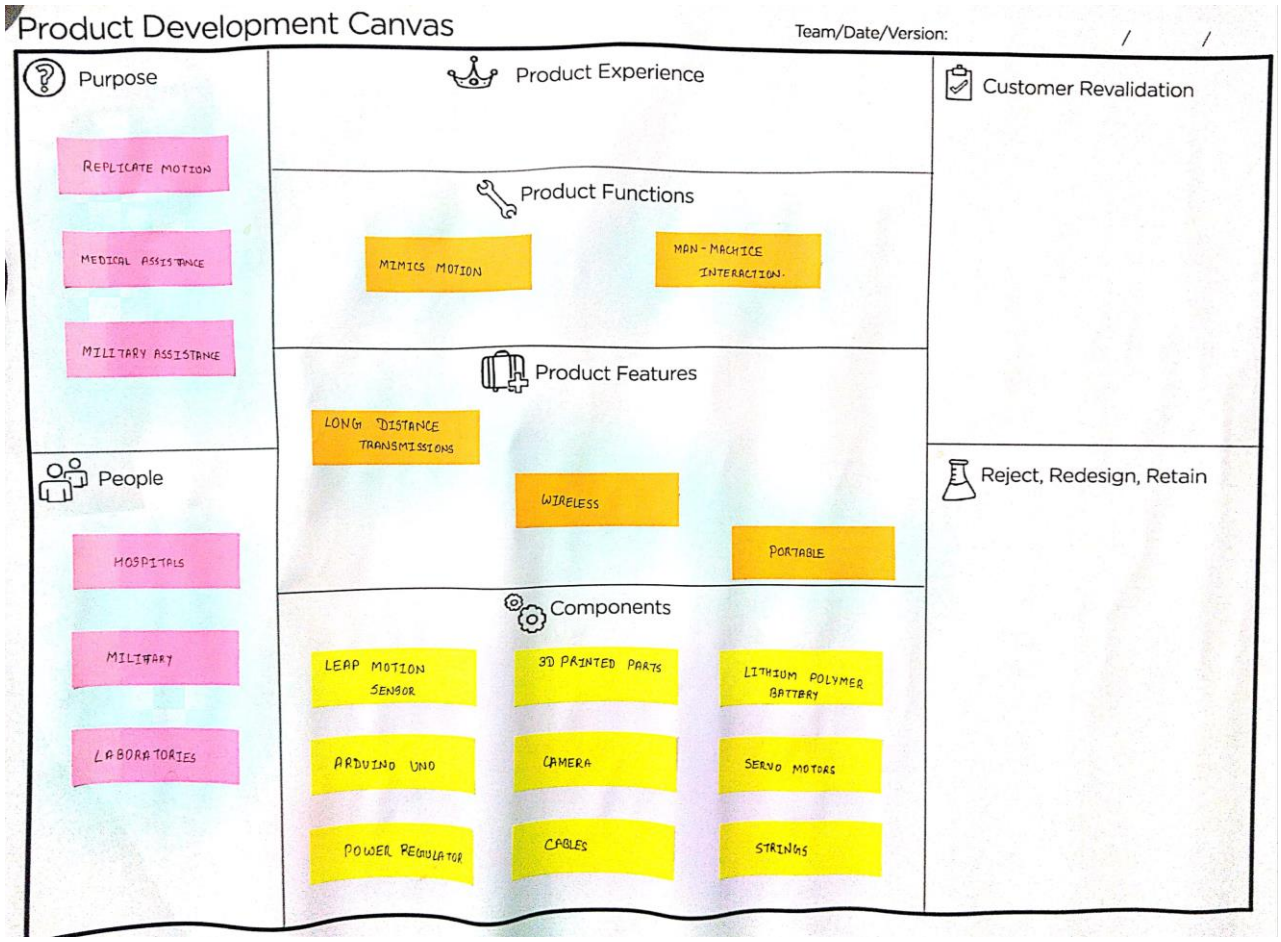
2.1 AEIOU Framework



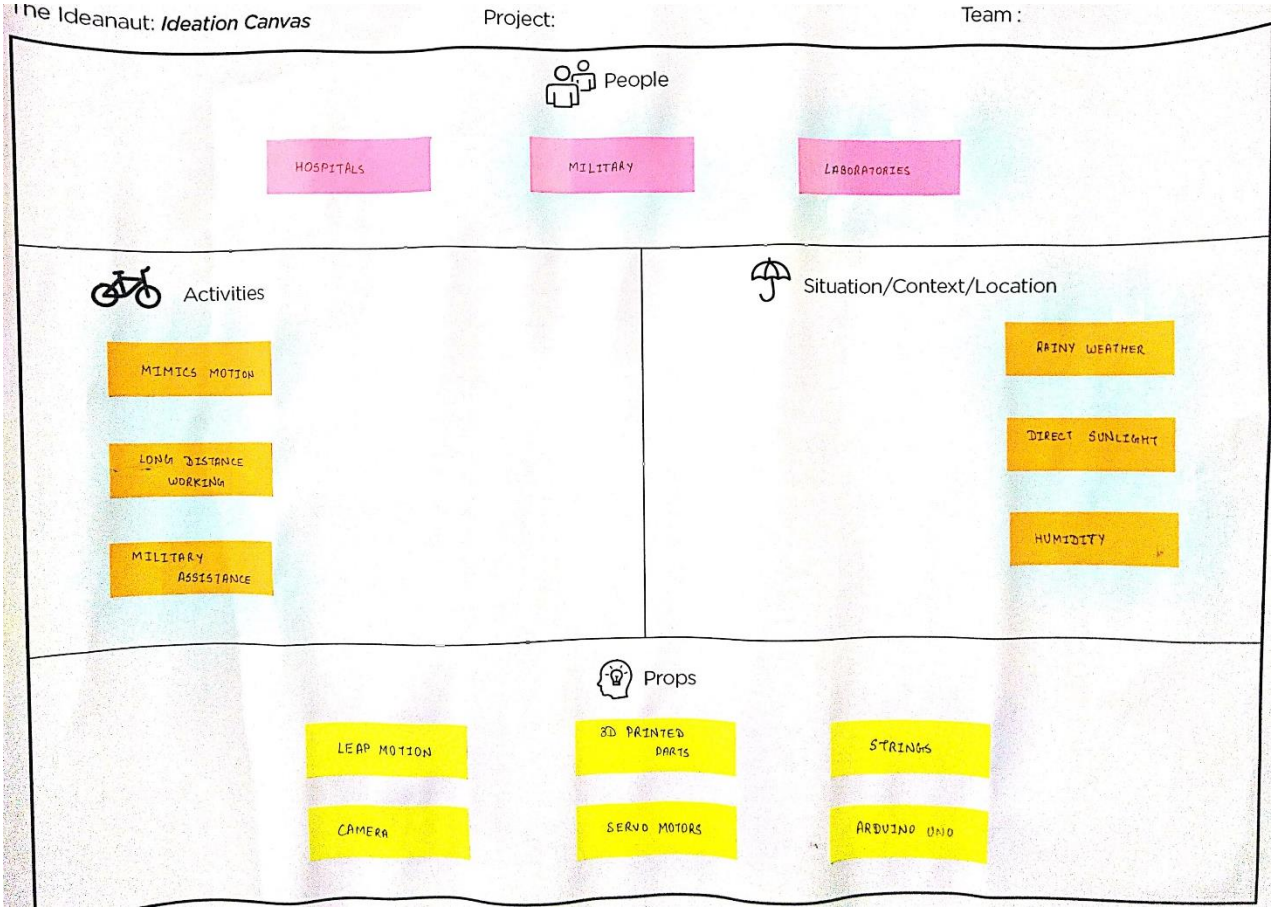
2.2 Empathy Mapping Canvas



2.3 Product Development Canvas



2.4 Ideation Canvas



3 IMPLEMENTATIONS

3.1 Conceptual Geometry

3.1 Cost Analysis

Product	Quantity	Price in Rupees
Arduino Uno	1	350
MG995r Servo	5	1350
Braided fishing line	2 m	20
Black PLA	1 Kg.	4610
Servo SG90	1	120
Leap Motion	1	8000
Bolts and Nuts	-	40
Drill and Finishing kit	1	950
	TOTAL	15440

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