# Task Proposal

## Meeting Date for the Proposal

23/12/24

## Task Code

WP4 T3.1.3 – Tactile Sensor Design

## Task Version

Version 1

## Task Members

### Task Lead:

Daniel Pawlak

## Task Description

### Initial Task Goal(s):

Design of Tactile Sensor

### How this Task links overall to the WP:

Tactile sensors grant robots a sense of touch that grants the ability of object detection and measurement of force exerted on the environment. This allows for the grasping of objects alongside slip detection.

## Task Results

Using contact sensors as the chosen approach in the magnetic variant the sensor mimics the human skin by measuring the deformation of ‘skin’ via the change in magnetic field caused by the displacement of the embedded permanent magnet following its consequent change in magnetic field measured by a hall effect sensor.

### What was delivered:

Concept Sketch:

A diagram of a magnet

Description automatically generated

Concept of the sensor using a permanent magnet embedded in a silicon mould using 3D printed trays and shapes seen below.

A close-up of a box

Description automatically generated

* A+B show the ‘tray’ base that hold the hall effect sensors with basic screw holes as the initial connection between sensor and finger
* C shows the initial mould with dent for circular permanent magnet
* D is the final mould that covers the magnet and finishes the shape

A diagram of a sensor voltage

Description automatically generated

Proof of concept showing how the sensor works with the baseline being half the input voltage with the bases and limits depending on magnet polarity as the hall effect works both ways.

### Why we think this approach will work:

* Cheap and quick method to implement
* Silicon provides a ‘grippy’ surface that aids in holding objects
* Easily can be integrated into chosen micro-controllers
* Method type is applicable to space scenarios
* Shape is modifiable to accommodate to finger design

## Supporting Task Research and Supervisor Notes

### Why have you completed the task this way:

Because it seems like the most feasible approach.

### What previous research or methodology did you use to complete this task and why:

Looked at papers referring to types of tactile sensing and the bio-inspiration behind it looking at mechanoreceptors [1] in our skin. The main inspiration shown in adaptation below is that the magnet is stationary whilst the elastic material is magnetic.

A finger pressing a magnet

Description automatically generated[2]

### References:

*[1] C L Taylor and R J Schwarz. The anatomy and mechanics of the human hand. Artif Limbs, 2(2):22–35, May 1955*

*[2] Takumi Kawasetsu, Takato Horii, Hisashi Ishihara, and Minoru Asada. Mexican-hat-like response in a flexible tactile sensor using a magnetorheological elastomer. Sensors, 18(2):587,2018.*

### What points were mentioned by the supervisor related to this task (if any):

## Agreement

### Which team members agree/disagree with the results/approach for this Task:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Member | Stephanie  Buchanan | Ismail Hendryx | Kautilya  Chappidi | Jonathon Wong | Daniel Pawlak | Mohammed Islam | Gallad Isse |
| Agree( ) or Disagree( ) | () | () | () | () | () | () | () |

### Who Disagrees and why:

N/A