PROJECT THREE: MILESTONE 2 – COVER PAGE

Team Number: Thurs-14

Please list full names and MacID's of all *present* Team Members.

Full Name:	MacID:
Kartik Chaudhari	chaudk4
Yuvraj Sandhu	Sandhuy
Kelvin Weng	wengc3
Mahmoud El Shafei	elshafem

MILESTONE 2 (STAGE 1) – SENSOR RESEARCH (COMPUTATION SUB-TEAM)

Team Number: Thurs-14

You should have already completed this task individually *prior* to Design Studio 14.

1. Each team member is expected to research 3 types of sensors for characterizing bins
   → Refer to Table 3 of the Computation Sub-Team Objectives document
2. For each sensor:
   → Briefly describe how the sensor works
   → Indicate the attribute you would measure to characterize each bin (refer to Table 4 of the Computation Sub-Team Objectives document)

We are asking that you submit your work on both worksheets. It does seem redundant, but there are valid reasons for this:

- Each team member needs to submit their sensor research with the **Milestone Two Individual Worksheets** document so that it can be ***graded***
- Compiling your individual work into this **Milestone Two Team Worksheets** document allows you to readily access your team member's work
  - This will be especially helpful when completing ***Stage 3*** of the milestone

Team Number: Thurs-14

Name: Kelvin Weng	MacID: wengc3

Sensor Type	Description	Attribute(s)
Color sensor	It can distinguish colors thought the brightness of light, then it sends this signal to the intelligent brick	Used to identify different bin by colors
Hall sensor	In the presence of a magnetic field, It convert magnetic or magnetically encoded information into electrical signals	This can be used to distinguish metals and non-metals
LDR	The light is emitted from the transmitter and the receiver senses the strength of the light to send out different signals.	Different materials have different transparency So the receiver can distinguish different materials by receiving light of different intensities

Team Number: Thurs-14

Name: Mahmoud El Shafei	MacID: elshafem

Sensor Type	Description	Attribute(s)
Ultrasonic Sensors	• An ultrasonic sensor is an electronic device • Measures the distance of a target object by emitting ultrasonic sound wave and calculating the time it takes to echo	Can detect distance the bin is from the sensor
Active Infrared (IR) Sensor	• Measure and detects infrared light • Can be used as proximity sensor • LED gives off light, and if an object with a temperature about 5 kelvin passes Infront, infrared light will bounce off and reflects into the sensor. The waves bounce back off a nearby object and enter the sensor again for detection	Can be used to detect the proximity of a bin to the sensor with defined reading of the edges
Retro-Reflective Photoelectric Sensor	• Photoelectric sensors consisting of an emitter and receiver • Light emitted by the emitter is reflected to the receiver with a reflector • When the reflected light beam is obstructed, the output signal of the sensor changes	Could be used to detect the presence of bins

MILESTONE 2 (STAGE 2) – CONCEPT SKETCHES (MODELLING SUB-TEAM)

Team Number: Thurs-14

You should have already completed this task individually *prior* to Design Studio 14.

1. Copy-and-paste each sub-team member's refined sketch on the following pages (1 sketch per page)
   → Be sure to indicate each team member's Name and MacID

We are asking that you submit your work on both worksheets. It does seem redundant, but there are valid reasons for this:

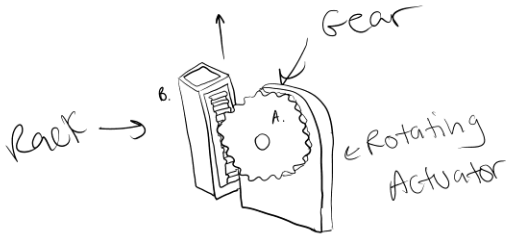
- Each team member needs to submit their concept sketches with the **Milestone Two Individual Worksheets** document so that it can be ***graded***
- Compiling your individual work into this **Milestone Two Team Worksheets** document allows you to readily access your team member's work
  - This will be especially helpful when completing ***Stage 4*** of the milestone

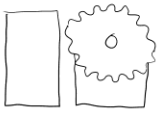
Team Number: Thurs-14

Name: Yuvraj Sandhu	MacID: Sandhuy

Rotating Actuator:

SKETCH 1





SIDE-VIEW

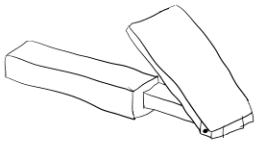
Yuvraj Sandhu
400314139
THURS-14
Jan 21, 2020

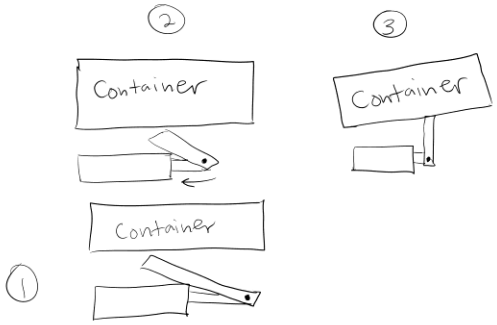
A. As the gear rotates, it moves the metal rack linearly upwards/downwards.

B. Sliding rack with a housing so it only moves up/down.

Linear Actuator:

SKETCH 2





The system relies on the force of the container to keep its position.

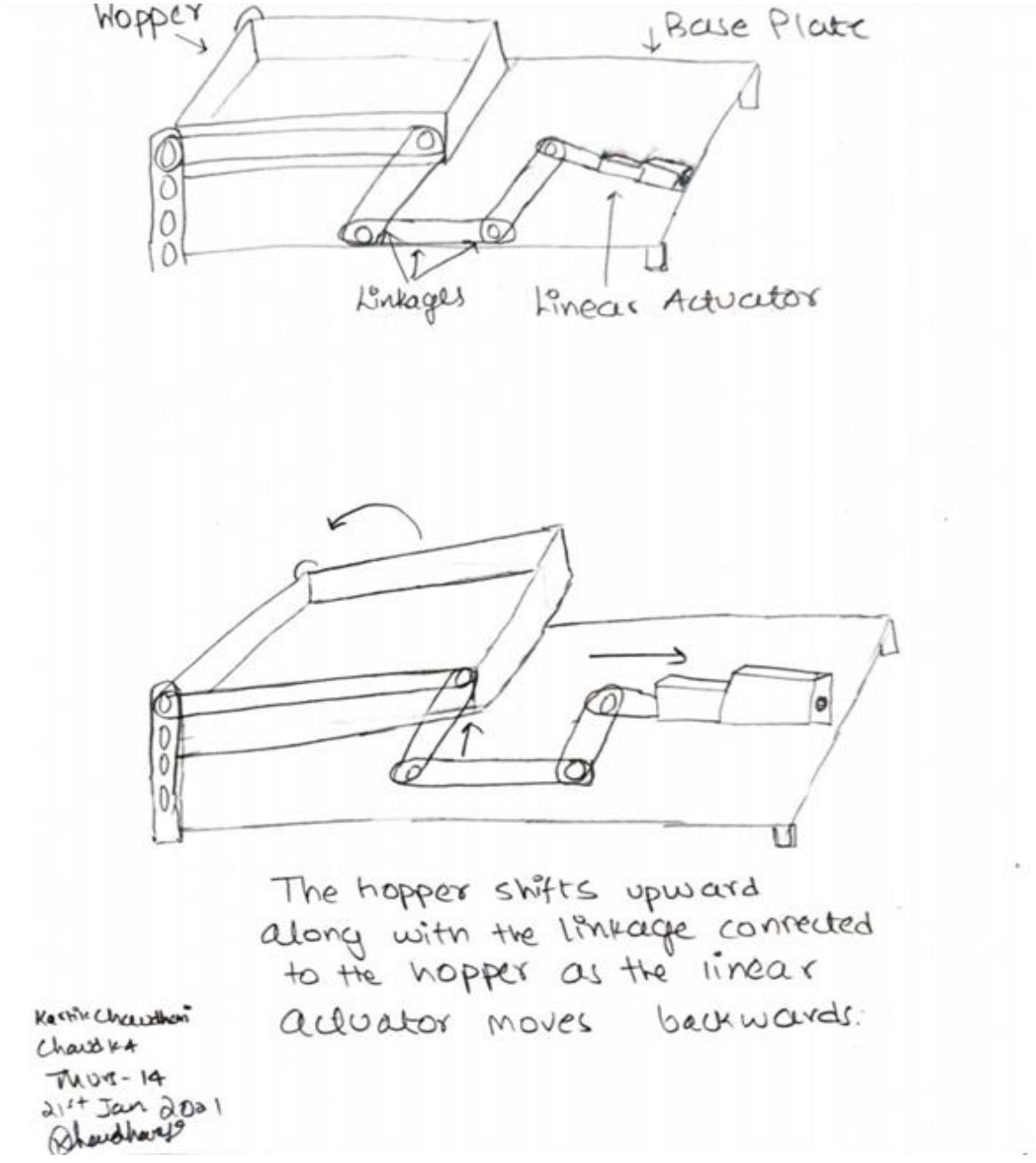
SIDE VIEW / FUNCTION

Yuvraj Sandhu
sandhuY
40031934
Jan 21, 2021

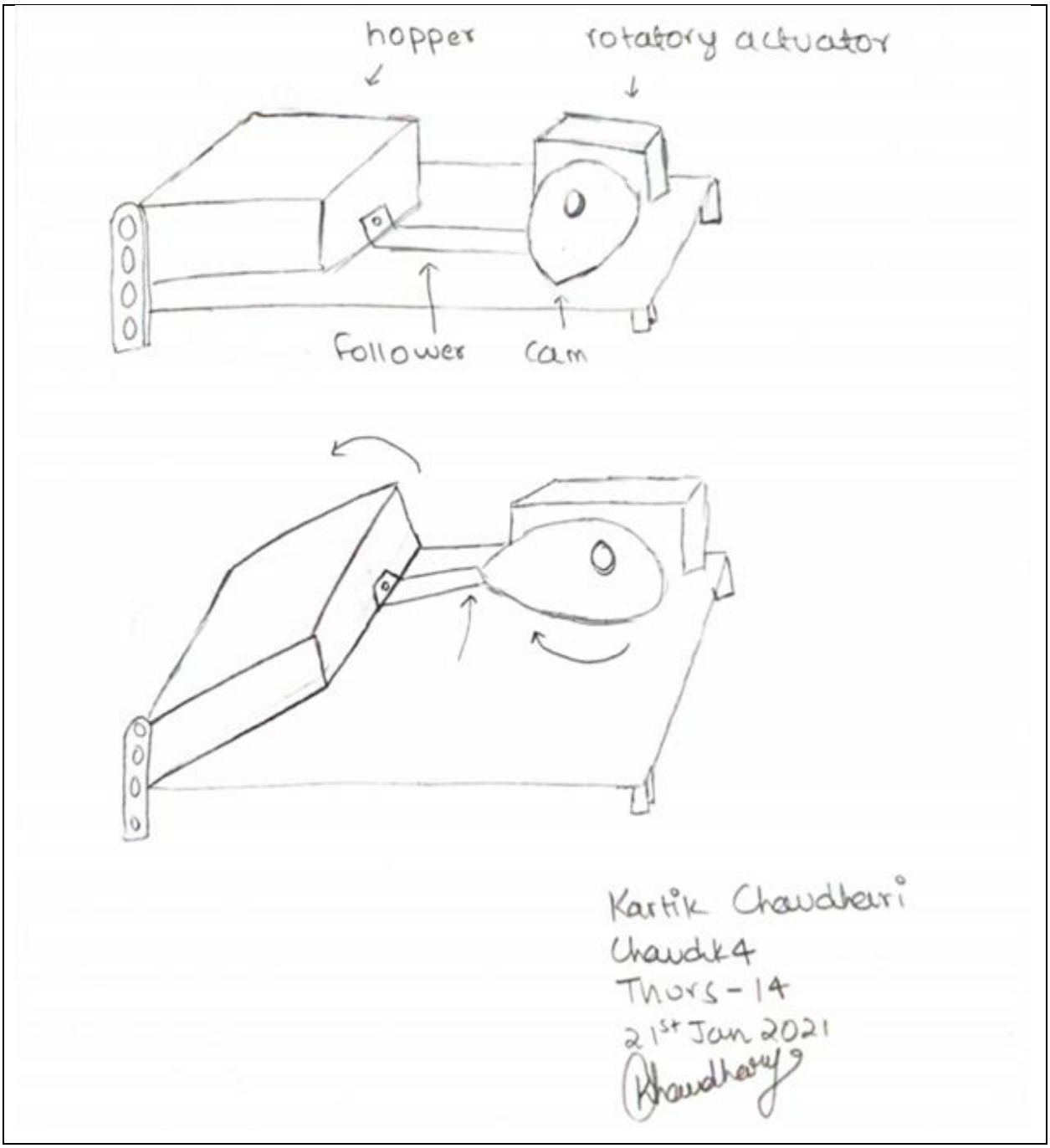
Team Number: Thurs-14

Name: Kartik Chaudhari	MacID: chaudk4

Linear:



Rotatory:



*If you are in a sub-team of 3, please copy and paste the above on a new page

MILESTONE 2 (STAGE 3) – SENSOR CHARACTERIZATION (COMPUTATION SUB-TEAM)

Team Number: Thurs-14

1. As a team, consolidate the results of your individual sensor research
   → Discuss your findings and appropriateness of each sensor for your application
   → Keep discussion brief, using point form

Sensor Type	**Findings and Appropriateness for Application**
Color sensor	Used to identify different bin by colors. It can distinguish colors thought the brightness of light, then it sends this signal to the intelligent brick.
Hall sensor	This can be used to distinguish metals and non-metals.
LDR	Different materials have different transparency So the receiver can distinguish different materials by receiving light of different intensities
Retro-Reflective Photoelectric Sensor	• Output sensor changes when beam of light is obstructed, could be used in detecting the presence of bin • Not appropriate because its impossible to distinguish between different bins
Ultrasonic Sensor	• With the use of ultrasonic sound waves it can detect if there is an object and determine distance away from the robot • It is a good choice to use but it is not as reliable and easy to function as a colour sensor
Active Infrared (IR) light	• Uses the reflected IR light from an object to determine if an object is present. Useful in finding the location of the edges of a bin • Could be used but it's much more complicated to function and implement. It only distinguishes the presence of an object not the feature

2. Identify one sensor to incorporate into your computer program

Colour sensor

3. Identify an attribute value for each bin

Bin ID	**Attribute Value**
Bin01: Metal Bin	Change colour to red
Bin02: Paper Bin	Change colour to blue
Bin03: Plastic Bin	Change colour to purple
Bin04: Garbage Bin	Change colour to green

MILESTONE 2 (STAGE 4) – DECISION MATRIX (MODELLING SUB-TEAM)

Team Number: Thurs-14

1. As a team, establish a weighting factor for each criterion
   → Move row-by-row
   - If *Criteria 1* is preferred over *Criteria 2*, assign a 1. Otherwise, assign 0
   - If *Criteria 1* is preferred over *Criteria 3*, assign a 1. Otherwise, assign 0

   → Add additional rows/columns as needed

	Simplicity	Strength	Practicality	*Efficiency*	Durability	*Ease of modelling*	**Score**
Simplicity	*1*	*1*	1	1	1	1	6
Strength	0	1	1	1	1	1	5
Practicality	0	0	1	1	1	1	4
Efficiency	0	0	0	1	1	1	3
Durability	0	0	0	0	1	1	2

Ease of modelling	0	0	0	0	0	1	1

2. As a team, evaluate your concepts against each criterion using your weighting
   → Add additional rows as needed

	Weight	*Kartik 1st Design*		*Kartik 2nd Design*		*Yuvraj's 1st Design*		*Yuvraj 2nd Design*	
		Rating	Weighted Rating	Rating	Weighted Rating	Rating	Weighted Rating	Rating	Weighted Rating
Simplicity	6	2	12	4	18	3	18	2	12
Strength	5	2	10	2	10	2	10	3	15
Practicality	4	3	12	2	8	2	8	2	8
Efficiency	3	0	0	1	3	1.5	4.5	1	3
Durability	2	0	0	0.5	1	1	2	1	2
Ease of modelling	1	0.5	0.5	1	1	1	1	1	1
TOTAL			35		41		44		41

3. Discuss conclusions based on evaluation, including what concept you've chosen

We've decided to choose the simple rotational actuating design as through our discussion, we have concluded that its simple, yet effective design will be useful in many aspects of this project. As well as the ability to utilize gear ratio's and using simple constraints in Autodesk Inventor will prove to be beneficial.