MIT/WPU/ECE

Date: 07/09/2023

APPROVAL NOTE

Award Description	: Funding for Robotic Arm Grid 5.0
End User Team	: School of ECE
Estimated Value	: Rs ~62,500 /-

Brief Description :

The Flipkart GRiD, short for "Flipkart's Flagship Engineering Campus Challenge," is a prestigious nationwide hackathon that offers an exceptional opportunity for aspiring engineering talents in India to showcase their technical prowess and compete against the best. In its fifth edition, this challenge has evolved to become bigger and better than ever before.

Rounds :

Level 1: MCQ Test

Participants take an MCQ test to demonstrate their theoretical knowledge.

Level 2: Elimination Round

All participating teams are tasked with building a bot based on real-world e-commerce problem statements. They must submit their solutions before the specified deadline during the challenge window.

Level 3: The National Finale

Qualifying teams from Level 2 further develop and refine their bots while creating uninterrupted videos that align with the problem statement's requirements.

Dept. Comp. Engineering & Tech	Date 20/9/2023	
Budget Sanctioned (Lakhs)	24 Lakhs	(Academic Exp. –
Budget Utilized till date(Lakhs)	—	Student projects)
Purchase Requested(Lakhs)	0.62 Lakhs	03/10/23 62K
Program Director B M Pal	Dean, Engg. & Tech.	

Rewards and Prizes :

Attractive prizes to be won along with the opportunity to be a part of the hiring process for Tech Internships & Full-Time Roles (Internship Stipend: INR 1,00,000 per month; SDE-1 Role Compensation: INR 32 LPA):

- Winners get EGVs worth INR 1,50,000*
- First Runners-Up get EGVs worth INR 75,000*

Objectives :

- Object detection: The ability to identify and locate individual packages in a group of packages. This can be done using computer vision techniques such as image segmentation and object detection.
- Pick and place: The ability to pick up a package from a group of packages and place it in a specific location. This can be done using robotic arms or other automation devices.
- Orientation control: The ability to ensure that the shipment barcode is present on top of the package when it is dropped in the Drop-Zone. This can be done using sensors or other devices to detect the orientation of the package.

Level 1 Triumph in Flipkart GRiD Hackathon :

Our team's success in clearing Level 1 of the Flipkart GRiD Hackathon, amidst 24,596 participating teams, signifies our exceptional technical prowess and dedication. This accomplishment propels us forward as serious contenders in this prestigious competition, with the potential to make a substantial impact as we progress further.
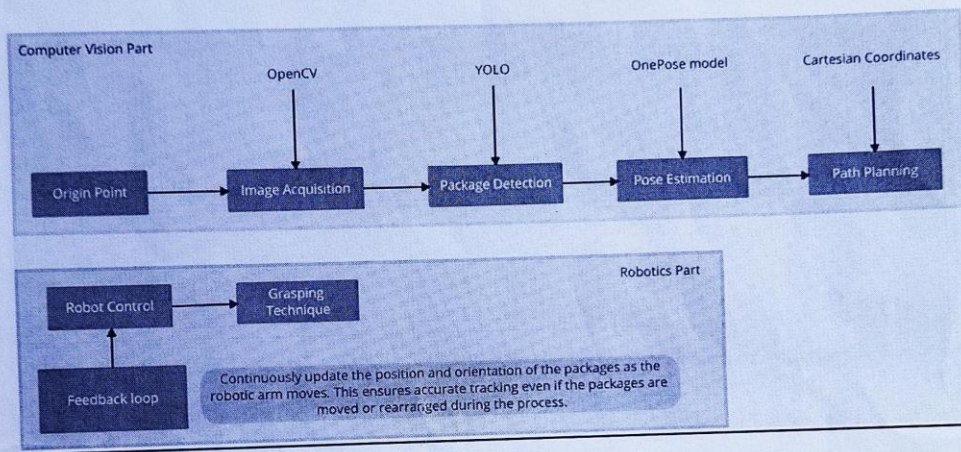
Current Status :

Timeline :
- Week 1 - Computer Vision + Components list (Done)
- Week 2 - Assembling + calibration of hardware part
- Week 3 - Testing + enhancing the speed
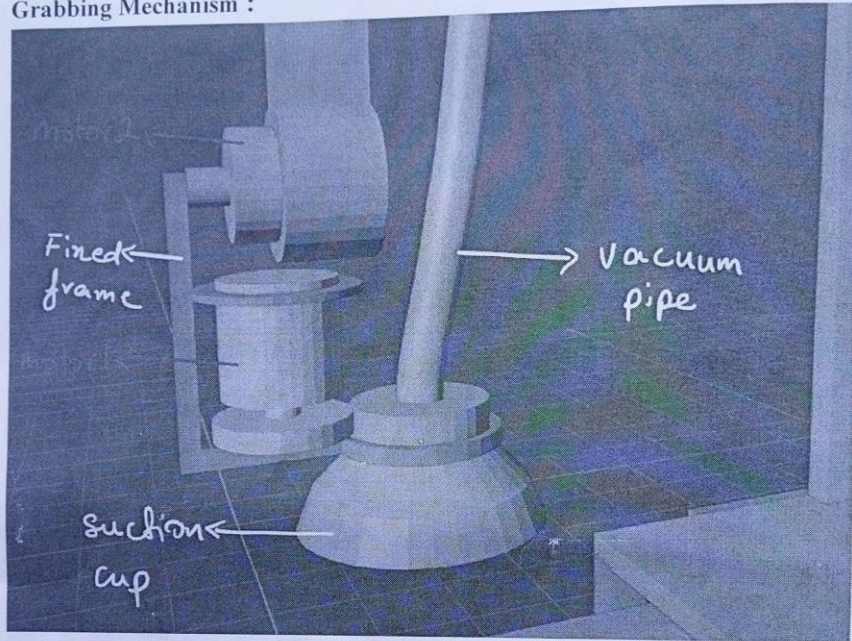- Week 4 - buffer

Workflow :

Computer Vision Part

OpenCV   YOLO   OnePose model   Cartesian Coordinates

Origin Point → Image Acquisition → Package Detection → Pose Estimation → Path Planning

Robotics Part

Robot Control → Grasping Technique

Feedback loop

Continuously update the position and orientation of the packages as the robotic arm moves. This ensures accurate tracking even if the packages are moved or rearranged during the process.

Grabbing Mechanism :

Fusion 360 Model :

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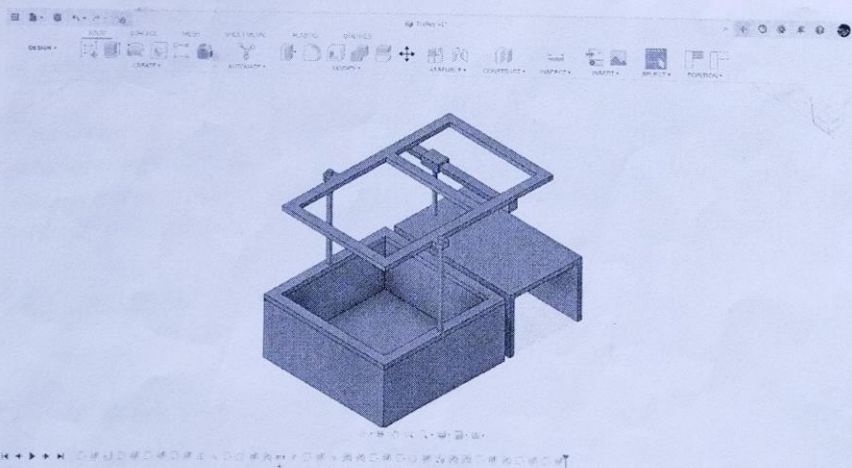
Vacuum Pressure Calculations:

Pressure lift

$$F = P_{atm} A_o - P_{suction} A_i$$

$$F = 5.4 N \text{ (for 550gm)}$$

$$5.4 = (101325 \times A_o) - (P_S A_i)$$
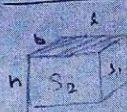
$$P_S = \frac{[(101325 - A_o) - 5.4]}{A_i}$$

$$=$$

$D_o = 90 mm$

$A_i =$

$A_o =$

Small box

in mm

$l = 203.2$ $A_t = 20645.12\ mm^2$

$b = 101.6$ $A_{S1} = 6451.6\ mm^2$

$h = 63.5$ $A_{S2} = 12903.2\ mm^2$

Med box
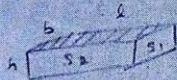
$l = 304.8$ $A_t = 61935.36\ mm^2$

$b = 203.2$ $A_{S1} = 33548.32\ mm^2$

$h = 105.1$ $A_{S2} = 60322.48\ mm^2$

Flyer

$l = 330.2$ $A_t = 83870.8\ mm^2$

$b = 254$

$h = 50.8$ $65\ cm^2 < A_o < 340\ cm^2$

$45.4\ mm < R_o < 103.51\ mm$

Sr. no.	Component	Qty	Price	Total	Link
1	Aluminum extrusion (1000mm)	12	₹ 549	₹ 6,588	https://robu.in/product/easymech-1000-mm-20x20-4-v-slot-aluminium-extrusion-profile-black/
2	V slot gantry	14	₹ 845	₹ 11,830	https://www.sunelectronics.co.in/V-Slot-Gantry-Kit-20mm
3	L corner bracket 2020 aluminum extrusion	6	₹ 99	₹ 594	https://robu.in/product/easymech-l-shape-corner-bracket-plate-for-2020-series-aluminium-profile/
4	L corner bracket bolt nut	2	₹ 79	₹ 158	https://robu.in/product/easymech-set-m4-x-8mm-socket-head-cap-allen-bolt-nut-12-pcs/
5	Z-axis Ball/Lead screw	2	₹ 439	₹ 878	https://robu.in/product/600mm-trapezoidal-lead-screw-8mm-thread-2mm-pitch-lead-screw-with-copper-nut/
6	Nema23 for Z axis	2	₹ 2480	₹4960	https://robu.in/pr

					oduct/nema23-57hs112-3004-hybrid-bipolar-stepper-motor/
7	Nema23 mount bracket bend	2	₹ 304	₹ 608	https://robu.in/product/bracket-nema-23-stepper-motor-bend/
8	Nema23 mount bracket straight	1	₹ 210	₹ 210	https://robu.in/product/easymech-bracket-for-nema-23-stepper-motor-straight/
9	Flexible Spider Shaft Coupling Bore:8x8mm (for Nema23)	2	₹ 398	₹ 398	https://robu.in/product/aluminum-od25mm-130mm-flexible-spider-shaft-coupling-bore-8x8mm/
10	Nema17 for XY axis	4	₹ 1199		https://robu.in/product/neema-17-jk42hs60-1704-0-72n-m-round-type/
11	Nema17 1000 mm Cable with Connector	4	₹ 40	₹ 160	https://robu.in/product/pure-copper-1000-mm-cable-with-connector-for-nema17-stepper-motor/
12	Nema17 mount bracket bend	3	₹ 199	₹ 597	https://robu.in/product/easymech-

No	Item	Qty	Unit Price	Total	Link
					bracket-for-nema-17-stepper-motor/
13	Nema17 mount bracket straight	2	₹ 168	₹ 336	https://robu.in/product/easymech-bracket-for-nema-17-stepper-motor-2/
15	Air compressor	1	₹ 9000	₹ 9000	https://www.amazon.in/ANMSALES-550W-Portable-Compressor-OUTSTANDING/dp/B09P6JKFZY?source=ps-sl-shoppingads-lpcontext&ref_=fplfs&psc=1&smid=A2QHB0MPQGLK14
16	Vacuum cup	3	$ 71.98	$ 215.94	https://www.grainger.com/product/SMC-Vacuum-Pad-Assembly-Bellows-30J711
18	Servo pan tilt for suction cup	2	₹ 899	₹ 1798	https://robokits.co.in/robot-kits/pan-tilt/2-axis-servo-pan-tilt
23	Screws m5*35	2	₹ 149	₹ 298	https://robu.in/product/easymech-set-of-m5-x-35-mm-socket-head-cap-allen-

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					bolt-and-nut-12-pcs/
24	LM rail 1000mm	1	₹ 3525	₹ 3525	https://robu.in/product/mgn7h-linear-guide-rail-1m/
25	H bot belt + pulley	1	₹ 832	₹ 832	https://robu.in/product/5-meter-x-gt2-timing-belt-2pcs-x-gt2-pulley-16-teeth/
26	Pulley 5mm bore for 6mm belt with 20 teeth	1	₹ 151	₹ 151	https://robu.in/product/aluminum-gt2-timing-pulley-for-6mm-belt-20-tooth-5mm-bore-2pcs/
27	GT2 Timing Idler Pulley For 6mm Belt 20 Tooth 5mm Bore	3	₹ 158	₹ 474	https://robu.in/product/aluminum-gt2-timing-idler-pulley-6mm-belt-20-tooth-5mm-bore-2pcs/
28	Raspberry Microcontroller	1	₹ 7227	₹ 7227	https://robu.in/product/raspberry-pi-4-model-b-with-8-gb-ram/
29	Nema23 motor driver	2	₹ 865	₹1730	https://robu.in/product/tb6600-0-2-5a-cnc-controller-stepper-motor-driver-single-axes-two-phase-hybrid-stepper-motor-for-cnc/

No.	Item	Qty	Unit Price	Total	Link
30	Alternate driver for nema 23				https://robu.in/product/leadshine-dm542-digital-stepper-motor-driver-20-50-vdc-with-1-0-4-2a/
31	Nema17 motor driver	5	₹ 73	₹ 365	https://robu.in/product/l298n-dual-h-bridge-dc-stepper-motor-driver-controller-module/
32	alternative driver for nema17				https://robu.in/product/a4988-driver-stepper-motor-driver-standard-quality/
33	Z axis rod	2	₹ 444	₹ 888	https://robu.in/product/500-mm-long-chrome-plated-smooth-rod-diameter-16-mm/
34	mount bracket for rod and pan tilt	1	-	-	3d print from college
35	miscellaneous			₹ 5500	
	Total			₹ 62,500	

Team Members :
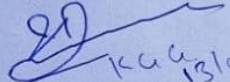
Sr no.	Name	Contact / Email	Department
1	Ankit Yadav	9372212527	ECE
2	Prathamesh Chavan	9423989471	CSE
3	Mihir Khatavkar	7588969106	Mech. Engg
4	Pranav Advani	7007728050	CSE
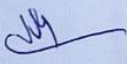
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SIGN-OFF PAGE:-

Prepared/Requested By

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DR VISHWANATH KARAD MIT WORLD PEACE UNIVERSITY
Budget for the year 2023-24
Department Computer Engineering and Technology (Dept.CET)

Rs in Crore

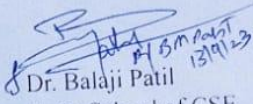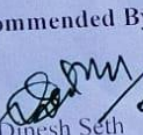| Budget Head -L1	Budget Main Head - L2	Budget Sub- Head - L3	Budget Discription -L4	Computer Engineering and Technology Santioned
Academic Expenses			Honorarium Guest-Workshop	
			Mis Expenses-Workshop	
			Training Charges- Workshop	
			Printing & Stationery- Workshop	
	Student Activity - Social			1.15
		Common Events /HO Level		
			Travelling Expenses- Common	
			Lodging & Boarding- Common	
			Advertisement- Common Event	
			Food Expenses- Common Event	
			Event Decoration- Common Event	
			Mis Expenses- Common Event	
			Guest Felicitation- Common Event	
			Honorarium Guest- Common	
			Hardware Rental- Common Event	
			Printing & Stationery- Common	0.31
		Gatherings & Events		
			Travelling Expenses -Gatherings &	
			Lodging & Boarding-Gatherings &	
			Advertisement-Gatherings &	
			Food Expenses-Gatherings &	
			Event Decoration-Gatherings &	
			Mis Expenses-Gatherings & Events	
			Guest Felicitation-Gatherings &	
			Honorarium Guest-Gatherings &	
			Hardware Rental- Common Event	
			Printing & Stationery-Gatherings &	
		Cultural Activities		
			Travelling Expenses - Cultural	
			Lodging & Boarding - Cultural	
			Advertisement - Cultural Activity	
			Food Expenses-Misc Cultural	
			Event Decoration-Misc Cultural	
			Guest Felicitation-Misc Cultural	
			Honorarium Guest-Misc Cultural	
			Hardware Rental- Common Event	
			Printing & Stationery-Misc Cultural	0.09
	Student Extra - Curricular	Club Activities & Other Activity		
			Travelling Expenses- Club & Other	
			Lodging & Boarding-Club & Other	
			Advertisement-Club & Other	
			Food Expenses-Club & Other	
			Event Decoration-Club & Other	
			Mis & Other Consumable	
			Felicitation Expenses -Club &	
			Honorarium Guest-Club & Other	
			Registration Fees-Club & Other	0.24
		Student Projects		0.09
	Student Sport Activity	University Level		
			Travelling Expenses-Sports	
			Lodging & Boarding-Sports	
			Registration Fees-Sports	
			Food Expenses-Sports	
			Officiating Charges-Sports	
			Mis & Other Expenses-Sports	
			Sports Material-Sports	
		State Level		
			Travelling Expenses-Sports	
			Lodging & Boarding-Sports	
			Registration Fees-Sports	
			Food Expenses-Sports	
			Officiating Charges-Sports	
			Mis & Other Expenses Sports	
			Sports Material-Sports	
		National Level		
			Travelling Expenses-Sports	
			Lodging & Boarding-Sports	
			Registration Fees-Sports	
			Food Expenses-Sports	