

Team An-jel

Junior High Level

H.E.L.P.E.R.

Humanoid Experimental Lifter, Practical and Eco-friendly Robot

Theme: "Building Block Humanoid Robot"

TEAM MEMBERS:

Lawrence R. Costillas

Nyjel Vinz C. Villo

COACH:

Raymond B. Peñaflor

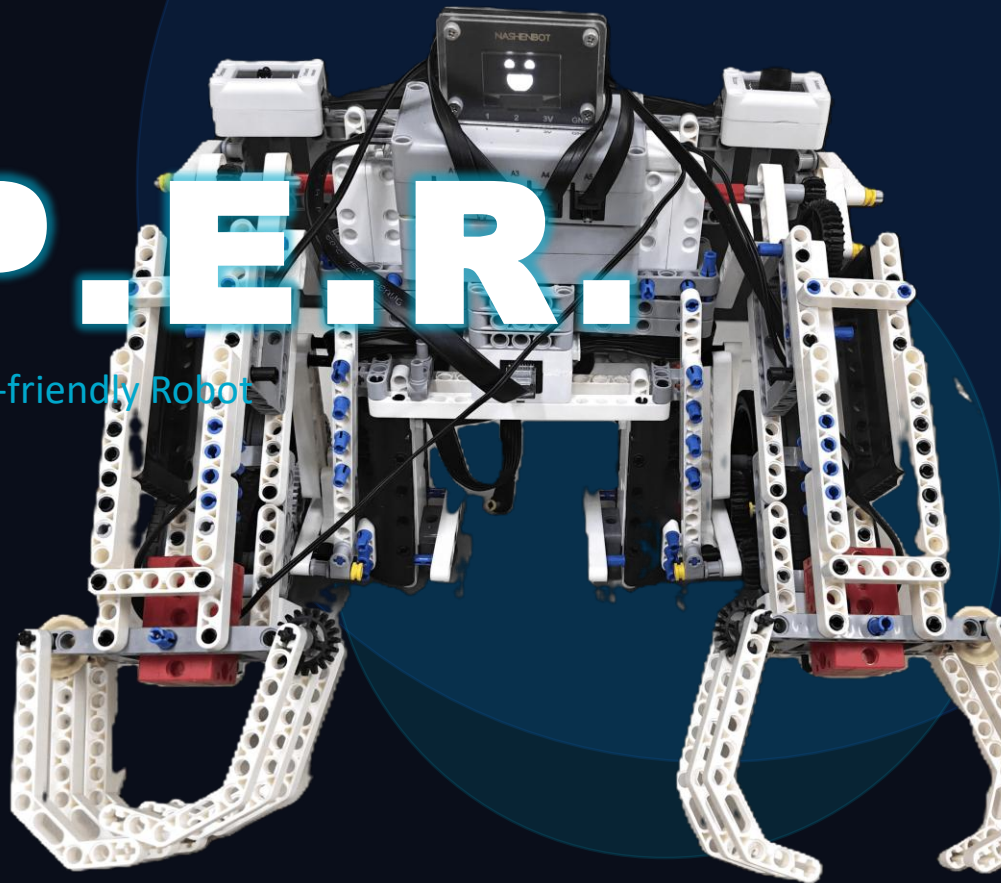


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01 | CREATIVE IDEAS & SOURCES OF INSPIRATION

The Core Problem: Communities worldwide struggle daily with plastic waste, manual labor hazards, and the need for approachable, affordable assistive technology.



Plastic Waste Crisis

Overflowing trash in streets and waterways inspired H.E.L.P.E.R.'s claw system — capable of picking up plastic bottles and waste materials for collection.



Accessible Robotics

The building-block design was inspired by the need to make robotics education accessible — easy to disassemble, rebuild, and understand by students at any level.



Hazardous Labor

Workers in dangerous environments (chemical areas, disaster zones) need robotic assistance. H.E.L.P.E.R. demonstrates a scalable approach to remote-operated task work.



STEM Education

Inspired by the goal of sparking interest in science and technology among youth — H.E.L.P.E.R. is a hands-on learning tool that demonstrates real engineering principles.



Lawrence R. Costillas

Member 1

- Programming
- Video Editing
- Project Report
- Video Narrator



Nyjel Vinz C. Villo

Member 2

- Robot Building & Assembly
- Videography
- Video Narrator

02 | COLLABORATION PROCESS

1

Phase 1: Concept & Planning

Both Members

Brainstormed the robot concept, defined objectives, assigned roles, and outlined the build plan together.

2

Phase 2: Assembly & Build

Nyjel (Lead)

Nyjel led the physical assembly of all robot components while Lawrence documented the process and prepared the program.

3

Phase 3: Programming

Lawrence (Lead)

Lawrence developed the block coding program for both remote-controlled and autonomous operating modes.

4

Phase 4: Testing & Refinement

Both Members

Joint testing sessions to identify issues, fine-tune motor responses, sensor calibration, and claw grip accuracy.

5

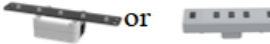
Phase 5: Documentation & Presentation

Lawrence (Lead)

Lawrence compiled the project report, edited the video, and prepared all written documentation for submission.

03 | PARTS LIST

No.	Electronic Component Name	Image	AISTEAM 101S		Quantity Used in Your Work
			1 Kit	2 Kits	
1	Controller		1	2	1
2	Lithium Battery		1	2	2
3	Motor Expansion Module		1	2	1
4	Encoder Motor		4	8	4
5	Servo Motor		1	2	0
6	Ordinary Motor		1	2	2
7	Infrared Sensor		1	2	2

No.	Electronic Component Name	Image	AISTEAM 101S		Quantity Used in Your Work
			1 Kit	2 Kits	
8	Single-line Follower Sensor		3	6	0
9	Infrared Remote Control Module		1	2	1
10	Full Color Light		2	4	0
11	Buzzer Module		1	2	1
12	Integrated 5-Grayscale Sensor	 or 	1	2	0
13	Display Screen		1	2	1
Total Quantity of Electronic Components			19	38	15

05 | PARTS LIST

No.	Building Block Name	Image	AISTEAM 101S		Quantity Used in Your Work
			1 Kit	2 Kits	
1	Bush For Cross Axle		4	8	8
2	Bolt and Shaft Connector		4	8	8
3	1x2 Cross Axle Connector		4	8	4
4	2# Cross Axle Connector		4	8	0
5	6# Cross Axle Connector		4	8	2
6	1/2 Bush		8	16	16
7	Half Cross Axle Half Bolt (Sliding)		10	20	8
8	Axle and Bolt Connector		4	8	0
9	Axle and Bolt Connector with hole		4	8	0
10	Beam 3 M. W/4 Snaps		4	8	2
11	Bolt Connector		4	8	4

No.	Building Block Name	Image	AISTEAM 101S		Quantity Used in Your Work
			1 Kit	2 Kits	
12	Cross Axle Cross Connector		4	8	4
13	Power Joint		1	2	2
14	Steel Ball		1	2	2
15	1x3 Cross Axle With End Stop		6	12	0
16	1x8 Cross Axle With End Stop		2	4	0
17	1+2 Cross Axle		4	8	0
18	Long Double-ended Bolt		10	20	0
19	Standard Bolt Friction Pin		70	140	129
20	Standard Bolt		10	20	20
21	3/4 Bolt		28	56	25
22	Long Friction Pin, Bolts at Both Ends		40	80	53

No.	Building Block Name	Image	AISTEAM 101S		Quantity Used in Your Work
			1 Kit	2 Kits	
23	Half Cross Axle Half Bolt		10	20	8
24	Cross Axle Long Bolt		10	20	0
25	1x3 Connector Axle and Bolt		4	8	2
26	1x3 Long Cross Axle Bolt		8	16	4
27	1x5x11 Panel		4	8	2
28	11x3 Panel with 10 Holes		4	8	4
29	5x11_#18 Panel		2	4	0
30	5x11_#17 Panel		2	4	0
31	3X5 L Beam		10	20	8
32	2X4 L Beam (Thick)		6	12	5
33	3X3 T Beam		2	4	4

08 | PARTS LIST

No.	Building Block Name	Image	AISTEAM 101S		Quantity Used in Your Work
			1 Kit	2 Kits	
34	3X7 Technic Angular Beam		4	8	2
35	11.5 Double Angular Beam		8	16	12
36	Cross Axle and Bolt Connector		6	12	4
37	1x1 Bolt Connector		4	8	3
38	U Beam		1	2	0
39	1x2 Cross Axle		4	8	4
40	Beam R. Frame 5X11		2	4	4
41	Beam Frame 5X7		8	16	15
42	Gear Wheel 24		2	4	0
43	Gear Wheel 20, Black		2	4	4
44	Gear Wheel 12, Black		2	4	4

No.	Building Block Name	Image	AISTEAM 101S		Quantity Used in Your Work
			1 Kit	2 Kits	
45	Gear Wheel 16		2	4	0
46	Gear Wheel 12, Yellow		2	4	4
47	Gear Wheel 20, Yellow		2	4	2
48	Gear Wheel 40		2	4	3
49	Gear Wheel 36		2	4	3
50	Gear Wheel 16		2	4	0
51	1x3 Technic Beam (Thick)		6	12	0
52	1x5 Technic Beam		4	8	8
53	1x7 Technic Beam		4	8	8
54	1x9 Technic Beam (Thick)		8	16	16
55	1x11 Technic Beam		6	12	12

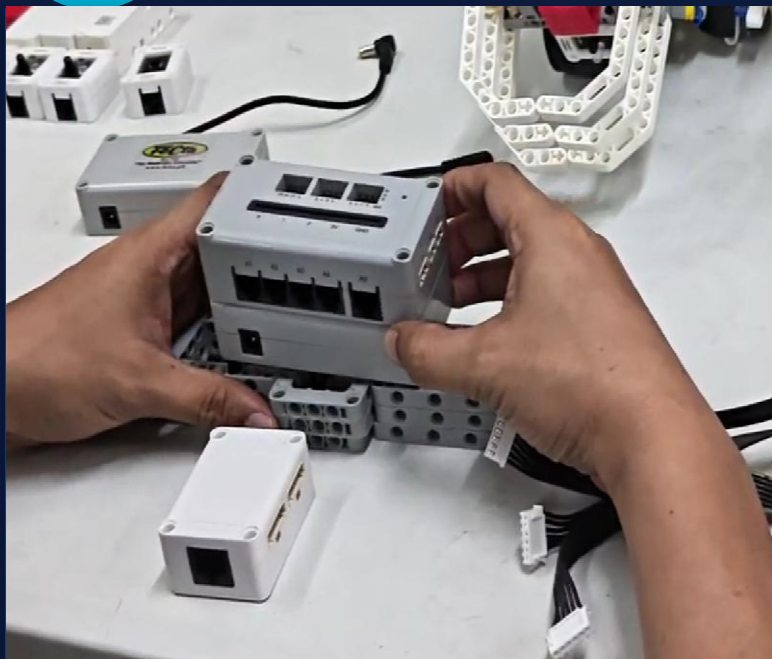
10 | PARTS LIST

No.	Building Block Name	Image	AISTEAM 101S		Quantity Used in Your
			1 Kit	2 Kits	
56	1x13 Technic Beam		2	4	4
57	1x15 Technic Beam		2	4	4
58	1x3 Cross Axle		4	8	0
59	1x4 Cross Axle		4	8	4
60	1x5 Cross Axle		4	8	2
61	1x7 Cross Axle		4	8	4
62	1x9 Cross Axle		4	8	4
63	16 Axle		2	4	0
64	Drive Wheel		2	4	4
65	Mecanum Wheel-L		2	4	0
66	Mecanum Wheel-R		2	4	0
Total Quantity of Building Blocks			407	814	458

01

Building the Core — Controller, Battery & Expansion Board

The torso is the heart of H.E.L.P.E.R. Everything begins here.



Main Controller

The brain — processes all logic and executes commands for every connected component.

Battery Pack

Provides stable power supply to all motors, sensors, and display components.

Expansion Board

Central hub — all encoder motors, ordinary motors, and sensors plug into this board.

12 | ROBOT ASSEMBLY — STEPS 2 & 3: LIMBS

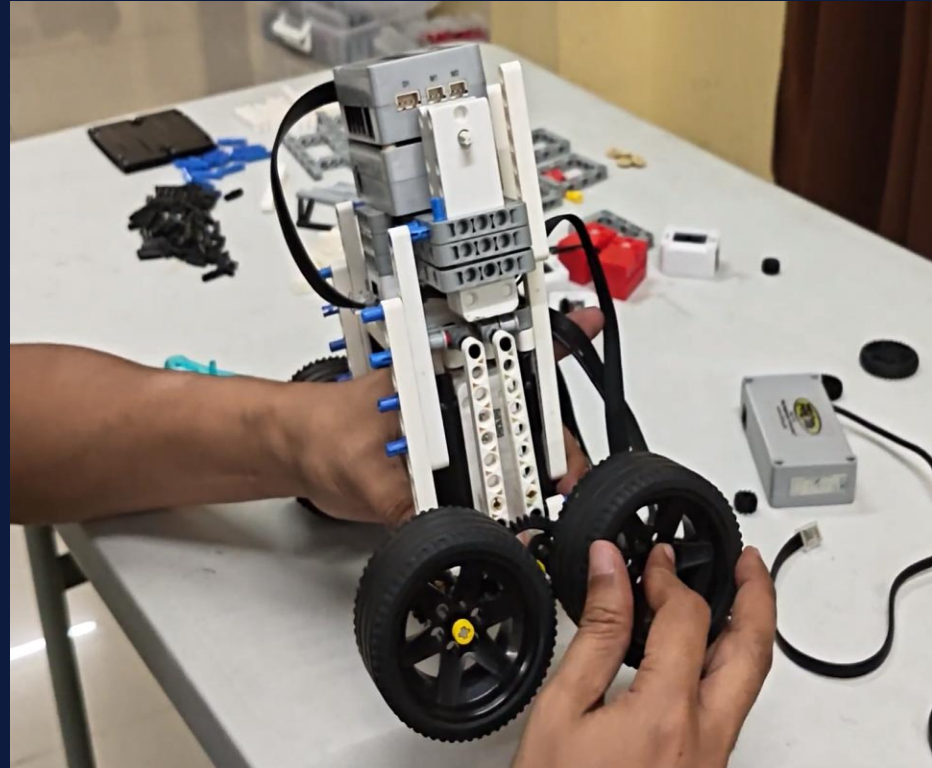
STEP 2 — Lower Limbs (Movement)

2 × Encoder Motors

Each leg is driven by one dedicated encoder motor.

4 × Wheels (2 per motor)

Attached to each encoder motor for stable locomotion. Enables forward, backward, left, and right movement.



03

Mechanical Claws

- 2 × Ordinary Motors (1 per claw)
- Each motor directly connected to controller
- Claw opens/closes to grip plastic bottles
- 2 × Obstacle Avoidance Sensors (1 per claw)
- Sensors also directly wired to controller
- Detects and reacts to nearby objects



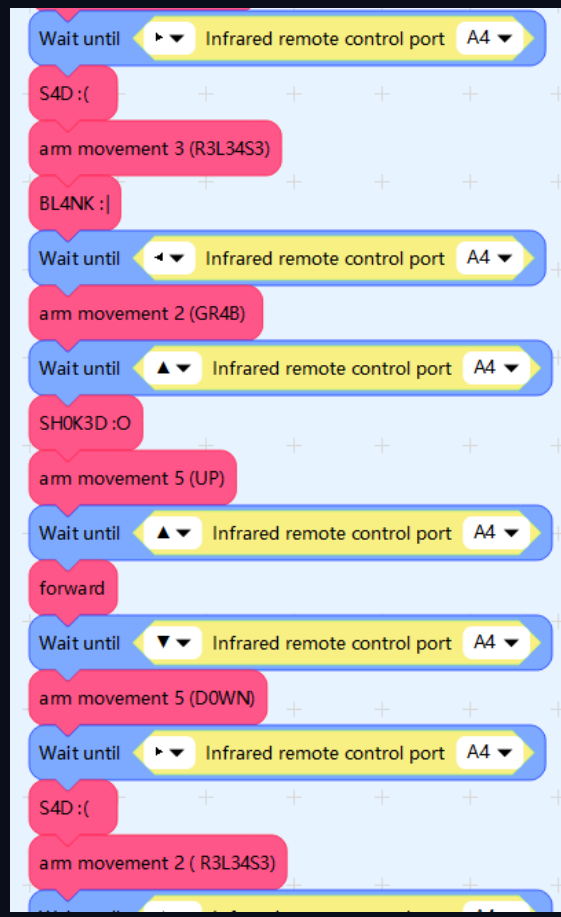
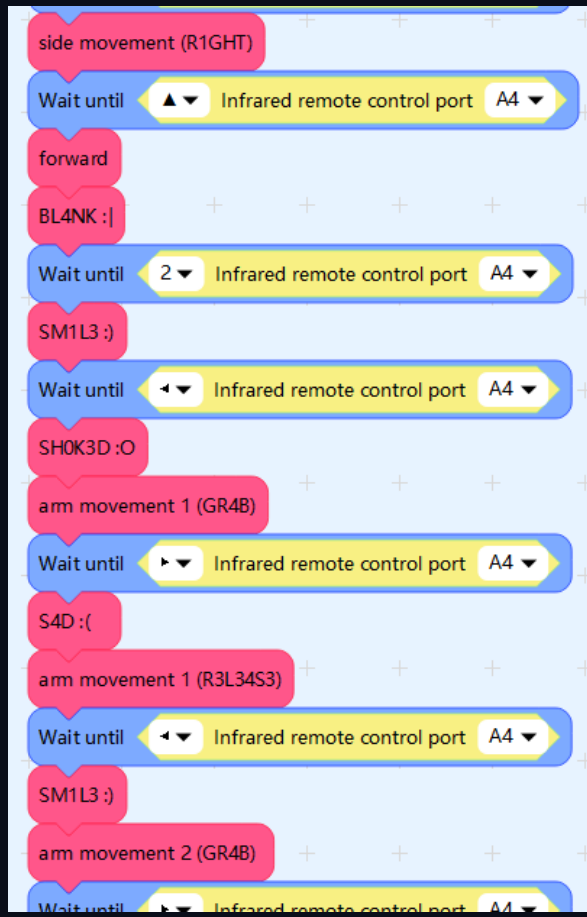
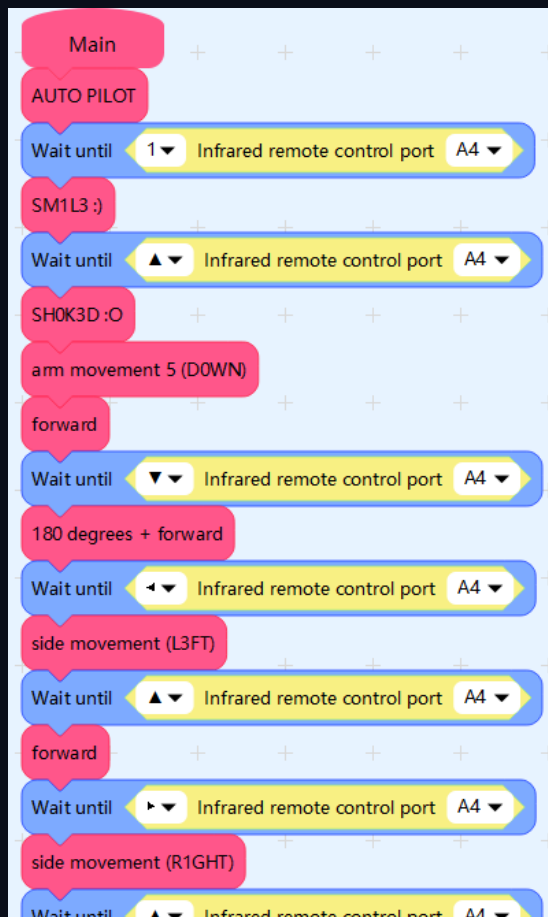
04

Senses & Communication

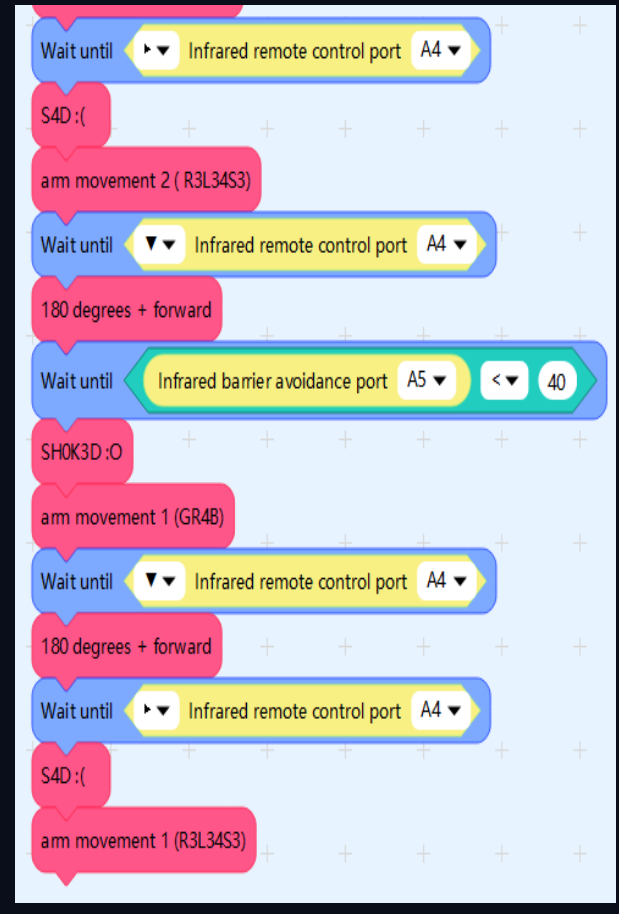
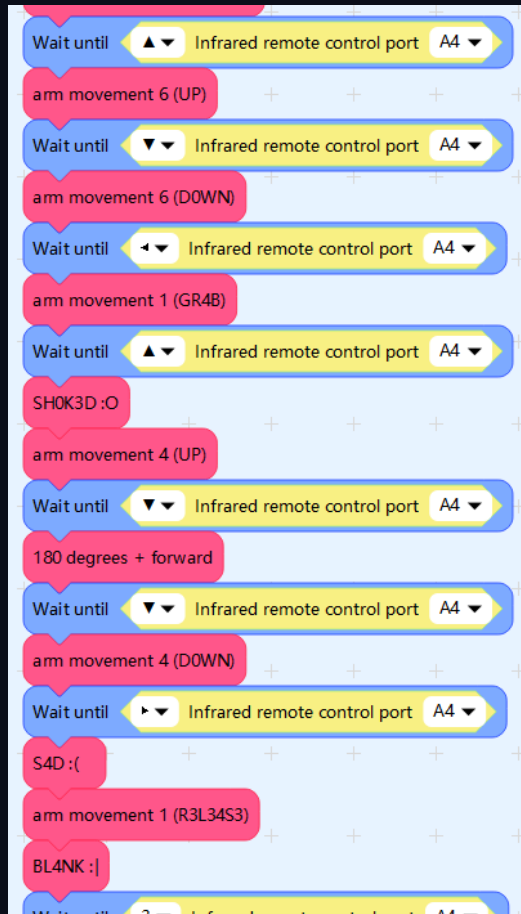
- 1 × Buzzer — audio alerts and task signals
- 1 × Digital Face Screen — projects robot expressions and status indicators
- 1 × Infrared Remote Sensor — receives remote control commands for manual Mode 1 operation



14 | PROGRAM — Block Coding



15 | PROGRAM — Block Coding



16 | PROGRAM — Block Coding



AUTO PILOT ▶

SM1L3 :)

Turn on the buzzer Port A3 ▾ Note C1 ▾ Beat 1/2 ▾

ID 1 ▾ Encoder motor M3 speed 42 M4 speed -70 M5 speed 0 M6 speed 0

Wait until Infrared barrier avoidance port A2 ▾ < ▾ 50

SH0K3D :O

Turn on the buzzer Port A3 ▾ Note C1 ▾ Beat 1/2 ▾

ID 1 ▾ Encoder motor M3 speed 0 M4 speed 0 M5 speed 0 M6 speed 0

NS GRAB 2

ID 1 ▾ Encoder motor M3 speed 42 M4 speed 70 M5 speed 0 M6 speed 0

Wait 2 s

ID 1 ▾ Encoder motor M3 speed 42 M4 speed -70 M5 speed 0 M6 speed 0

Wait until Infrared barrier avoidance port A5 ▾ < ▾ 50

ID 1 ▾ Encoder motor M3 speed 0 M4 speed 0 M5 speed 0 M6 speed 0

S4D :(

(STOP) NS GRAB 2

ID 1 ▾ Encoder motor M3 speed 42 M4 speed 70 M5 speed 0 M6 speed 0

Wait 2 s

ID 1 ▾ Encoder motor M3 speed 42 M4 speed -70 M5 speed 0 M6 speed 0

Wait until Infrared barrier avoidance port A5 ▾ < ▾ 50

SH0K3D :O

ID 1 ▾ Encoder motor M3 speed 0 M4 speed 0 M5 speed 0 M6 speed 0

NS GRAB 1

Turn on the buzzer Port A3 ▾ Note C1 ▾ Beat 1/2 ▾

ID 1 ▾ Encoder motor M3 speed 42 M4 speed 70 M5 speed 0 M6 speed 0

Wait 2 s

ID 1 ▾ Encoder motor M3 speed 42 M4 speed -70 M5 speed 0 M6 speed 0

Wait until Infrared barrier avoidance port A2 ▾ < ▾ 50

S4D :(

(STOP) NS GRAB 1

ID 1 ▾ Encoder motor M3 speed 0 M4 speed 0 M5 speed 0 M6 speed 0

17 | PROGRAM — Block Coding



SM1L3 :)

Turn on the buzzer Port A3 Note C5 Beat 1/2

Wait 0.07 s

Turn on the buzzer Port A3 Note C5 Beat 1/2

Wait 0.07 s

Turn on the buzzer Port A3 Note C5 Beat 1/2

The screen shows all black Clear the screen

draw circle fill center x: 40 y: 10 radius: 8

draw circle fill center x: 80 y: 10 radius: 8

draw circle fill center x: 60 y: 40 radius: 24

Screen display Clear 2 line

S4D :(

The screen shows all black Clear the screen

draw circle fill center x: 40 y: 10 radius: 8

draw circle fill center x: 80 y: 10 radius: 8

draw circle fill center x: 60 y: 55 radius: 23

Screen display Clear 2 line

Screen display Clear 4 line

SH0K3D :O

The screen shows all black Clear the screen

draw circle fill center x: 40 y: 10 radius: 8

draw circle fill center x: 80 y: 10 radius: 8

draw circle fill center x: 60 y: 40 radius: 15

BL4NK :)

The screen shows all black Clear the screen

draw circle fill center x: 40 y: 10 radius: 8

draw circle fill center x: 80 y: 10 radius: 8

Draw rectangle fill starting point x: 40 y: 45 width: 40 high: 1

18 | PROGRAM — Block Coding



180 degrees + forward

Turn on the buzzer Port A3 Note C1 Beat 1/2

ID 1 Encoder motor M3 speed 42 M4 speed 70 M5 speed 0 M6 speed 0

Wait 2 s

ID 1 Encoder motor M3 speed 42 M4 speed -70 M5 speed 0 M6 speed 0

Wait until OK Infrared remote control port A1

ID 1 Encoder motor M3 speed 0 M4 speed 0 M5 speed 0 M6 speed 0

backwards

Turn on the buzzer Port A3 Note C1 Beat 1/2

ID 1 Encoder motor M3 speed 42 M4 speed -70 M5 speed 0 M6 speed 0

Wait until OK Infrared remote control port A1

ID 1 Encoder motor M3 speed 0 M4 speed 0 M5 speed 0 M6 speed 0

forward

Turn on the buzzer Port A3 Note C1 Beat 1/2

ID 1 Encoder motor M3 speed 42 M4 speed -70 M5 speed 0 M6 speed 0

Wait until OK Infrared remote control port A1

ID 1 Encoder motor M3 speed 0 M4 speed 0 M5 speed 0 M6 speed 0

side movement (L3FT)

Turn on the buzzer Port A3 Note C1 Beat 1/2

ID 1 Encoder motor M3 speed -42 M4 speed -70 M5 speed 0 M6 speed 0

Wait 1.15 s

ID 1 Encoder motor M3 speed 0 M4 speed 0 M5 speed 0 M6 speed 0

side movement (R1GHT)

Turn on the buzzer Port A3 Note C1 Beat 1/2

ID 1 Encoder motor M3 speed 42 M4 speed 70 M5 speed 0 M6 speed 0

Wait 1.15 s

ID 1 Encoder motor M3 speed 0 M4 speed 0 M5 speed 0 M6 speed 0

SM1L3 :)

arm movement 6 (DOWN)

Turn on the buzzer Port A3 Note C1 Beat 1/2

ID 1 Encoder motor M3 speed 0 M4 speed 0 M5 speed -50 M6 speed -50

Wait until OK Infrared remote control port A4

ID 1 Encoder motor M3 speed 0 M4 speed 0 M5 speed 0 M6 speed 0

19 | PROGRAM — Block Coding



arm movement 5 (UP)

- Turn on the buzzer Port A3 Note C1 Beat 1/2
- ID 1 Encoder motor M3 speed 0 M4 speed 0 M5 speed 50 M6 speed 0
- Wait until OK Infrared remote control port A4
- ID 1 Encoder motor M3 speed 0 M4 speed 0 M5 speed 0 M6 speed 0

arm movement 5 (DOWN)

- Turn on the buzzer Port A3 Note C1 Beat 1/2
- ID 1 Encoder motor M3 speed 0 M4 speed 0 M5 speed -50 M6 speed 0
- Wait until OK Infrared remote control port A4
- ID 1 Encoder motor M3 speed 0 M4 speed 0 M5 speed 0 M6 speed 0

arm movement 4 (UP)

- Turn on the buzzer Port A3 Note C1 Beat 1/2
- ID 1 Encoder motor M3 speed 0 M4 speed 0 M5 speed 0 M6 speed 50
- Wait until OK Infrared remote control port A4
- ID 1 Encoder motor M3 speed 0 M4 speed 0 M5 speed 0 M6 speed 0

arm movement 4 (DOWN)

- Turn on the buzzer Port A3 Note C1 Beat 1/2
- ID 1 Encoder motor M3 speed 0 M4 speed 0 M5 speed 0 M6 speed -50
- Wait until OK Infrared remote control port A4
- ID 1 Encoder motor M3 speed 0 M4 speed 0 M5 speed 0 M6 speed 0

arm movement 6 (UP)

- Turn on the buzzer Port A3 Note C1 Beat 1/2
- ID 1 Encoder motor M3 speed 0 M4 speed 0 M5 speed 50 M6 speed 50
- Wait until OK Infrared remote control port A4
- ID 1 Encoder motor M3 speed 0 M4 speed 0 M5 speed 0 M6 speed 0

20 | PROGRAM — Block Coding



Block coding program for a robotic arm, organized into three columns and three rows of blocks.

Column 1:

- (STOP) NS GRAB 1** (Pink block)
- Turn on the buzzer Port** (Red block): A3, Note C1, Beat 1/2
- The speed of motor M1** (Green block): -20, The speed of M2: 0
- Wait** (Blue block): 0.5 s
- The speed of motor M1** (Green block): 0, The speed of M2: 0
- arm movement 2 (R3L3453)** (Pink block)
- Turn on the buzzer Port** (Red block): A3, Note C1, Beat 1/2
- The speed of motor M1** (Green block): 0, The speed of M2: 50
- Wait until** (Blue block): OK, Infrared remote control port A4
- The speed of motor M1** (Green block): 0, The speed of M2: 0
- arm movement 2 (GR4B)** (Pink block)
- Turn on the buzzer Port** (Red block): A3, Note C1, Beat 1/2
- The speed of motor M1** (Green block): 0, The speed of M2: -50
- Wait until** (Blue block): OK, Infrared remote control port A4
- The speed of motor M1** (Green block): 0, The speed of M2: 0

Column 2:

- arm movement 3 (GR4B)** (Pink block)
- Turn on the buzzer Port** (Red block): A3, Note C1, Beat 1/2
- The speed of motor M1** (Green block): 50, The speed of M2: -50
- Wait until** (Blue block): OK, Infrared remote control port A4
- The speed of motor M1** (Green block): 0, The speed of M2: 0
- (STOP) NS GRAB 2** (Pink block)
- Turn on the buzzer Port** (Red block): A3, Note C1, Beat 1/2
- The speed of motor M1** (Green block): 0, The speed of M2: 20
- Wait** (Blue block): 0.5 s
- The speed of motor M1** (Green block): 0, The speed of M2: 0
- NS GRAB 2** (Pink block)
- Turn on the buzzer Port** (Red block): A3, Note C1, Beat 1/2
- The speed of motor M1** (Green block): 0, The speed of M2: -20
- NS GRAB 1** (Pink block)
- Turn on the buzzer Port** (Red block): A3, Note C1, Beat 1/2
- The speed of motor M1** (Green block): 20, The speed of M2: 0

Column 3:

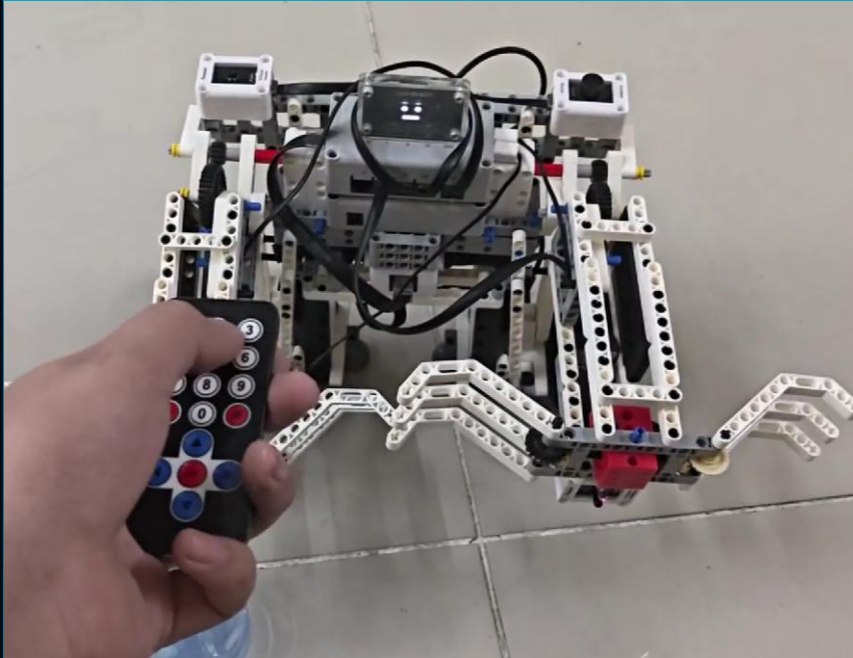
- arm movement 3 (R3L3453)** (Pink block)
- Turn on the buzzer Port** (Red block): A3, Note C1, Beat 1/2
- The speed of motor M1** (Green block): -50, The speed of M2: 50
- Wait until** (Blue block): OK, Infrared remote control port A4
- The speed of motor M1** (Green block): 0, The speed of M2: 0
- arm movement 1 (GR4B)** (Pink block)
- Turn on the buzzer Port** (Red block): A3, Note C1, Beat 1/2
- The speed of motor M1** (Green block): 50, The speed of M2: 0
- Wait until** (Blue block): OK, Infrared remote control port A4
- The speed of motor M1** (Green block): 0, The speed of M2: 0
- arm movement 1 (R3L3453)** (Pink block)
- Turn on the buzzer Port** (Red block): A3, Note C1, Beat 1/2
- The speed of motor M1** (Green block): -50, The speed of M2: 0
- Wait until** (Blue block): OK, Infrared remote control port A4
- The speed of motor M1** (Green block): 0, The speed of M2: 0

21 | PROGRAM — Block Coding

Below are screenshots of the actual block coding program used to operate H.E.L.P.E.R. in both modes:



MODE 1 — Remote Controlled



MODE 2 — Autonomous



22 | FUNCTIONAL DEMONSTRATION

MODE 1 — Remote Controlled

- 1 Operator uses infrared remote to control all robot movements.
- 2 H.E.L.P.E.R. moves forward, backward, and turns on command.
- 3 Arms position themselves toward a target — obstacle avoidance sensors detect nearby objects.
- 4 Claws close in and grip the target object (e.g., plastic bottle) firmly.
- 5 Buzzer emits a confirmation signal. Screen displays a success expression.

MODE 2 — Autonomous

- 1 No human input required — H.E.L.P.E.R. navigates independently using sensor feedback.
- 2 Obstacle avoidance sensors on both claws detect objects in the robot's path.
- 3 Robot adjusts direction and approaches the target object autonomously.
- 4 Claws activate automatically, grip the object, and trigger buzzer and screen confirmation.

23 | APPLICATION SCENARIOS



Community Waste Collection

H.E.L.P.E.R. can assist in picking up and sorting plastic bottles and trash in public spaces, helping reduce plastic pollution in communities, rivers, and coastlines.



STEM Education Tool

Used as a hands-on teaching aid in schools — students can build, program, and experiment with H.E.L.P.E.R. to learn robotics, coding, and engineering concepts.



Healthcare Assistance

In a scaled-up version, a similar robot design could retrieve and deliver small items within care facilities — reducing workload for healthcare workers.



Hazardous Environment Tasks

Remotely controlled via infrared, H.E.L.P.E.R. can be deployed in mildly dangerous spaces to retrieve objects without putting humans at risk.



Accessibility Support

For individuals with limited mobility, a robot with H.E.L.P.E.R.'s grip capabilities could assist with everyday object retrieval and basic task completion.



Disaster Relief Aid

Autonomous mode could be adapted for search tasks in debris-filled areas, delivering small supplies or signaling for help using the buzzer and screen.

01

Modular Building Block Architecture

Fully disassembleable and reconfigurable — lowering the barrier to robotics education. Any student can rebuild and modify H.E.L.P.E.R. without specialized tools.

02

Dual-Mode Intelligence

Seamlessly switches between human-controlled and fully autonomous operation — a level of operational flexibility uncommon in entry-level humanoid builds.

03

Smart Sensor-Equipped Claws

Each claw carries its own obstacle avoidance sensor, giving the robot distributed sensory awareness — a design feature that mirrors advanced robotic manipulation systems.

04

Expressive Human Interface

The digital face screen gives H.E.L.P.E.R. an expressive character, making human-robot interaction natural and approachable — key for real-world deployment acceptance.

05

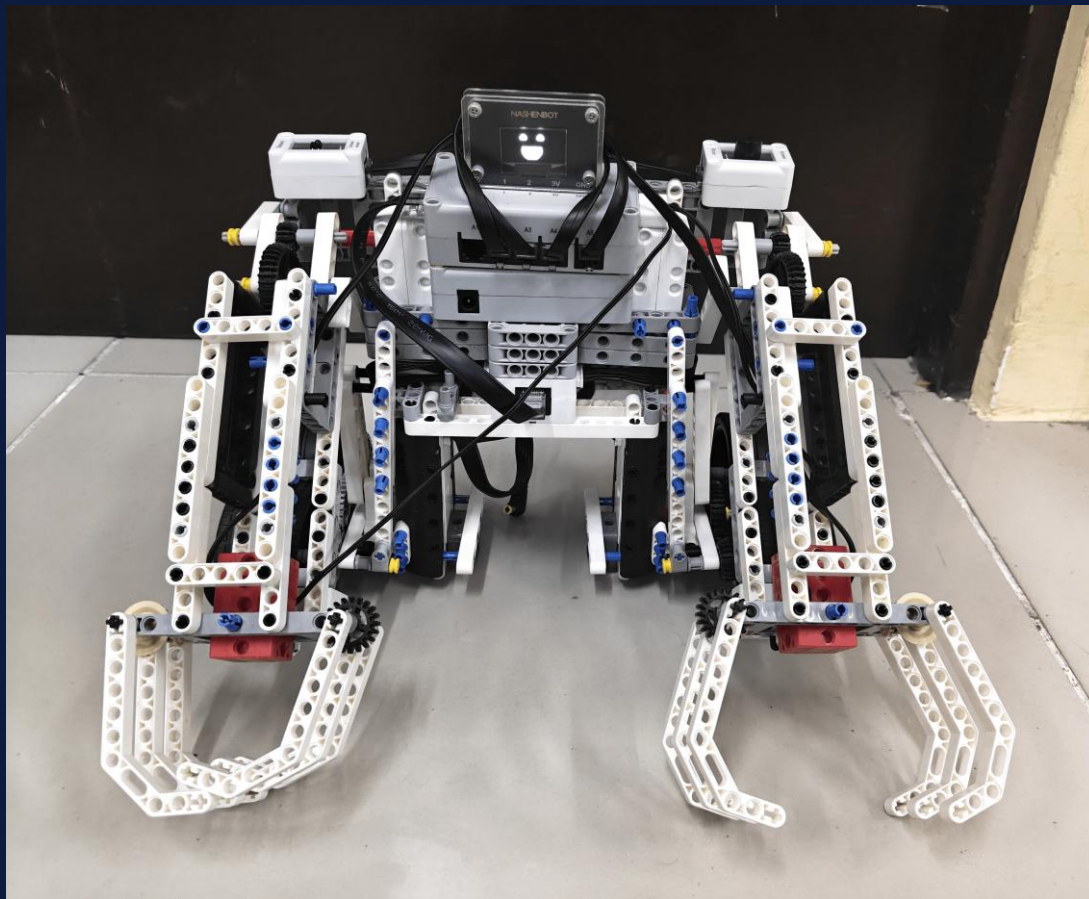
Real-World Problem Targeting

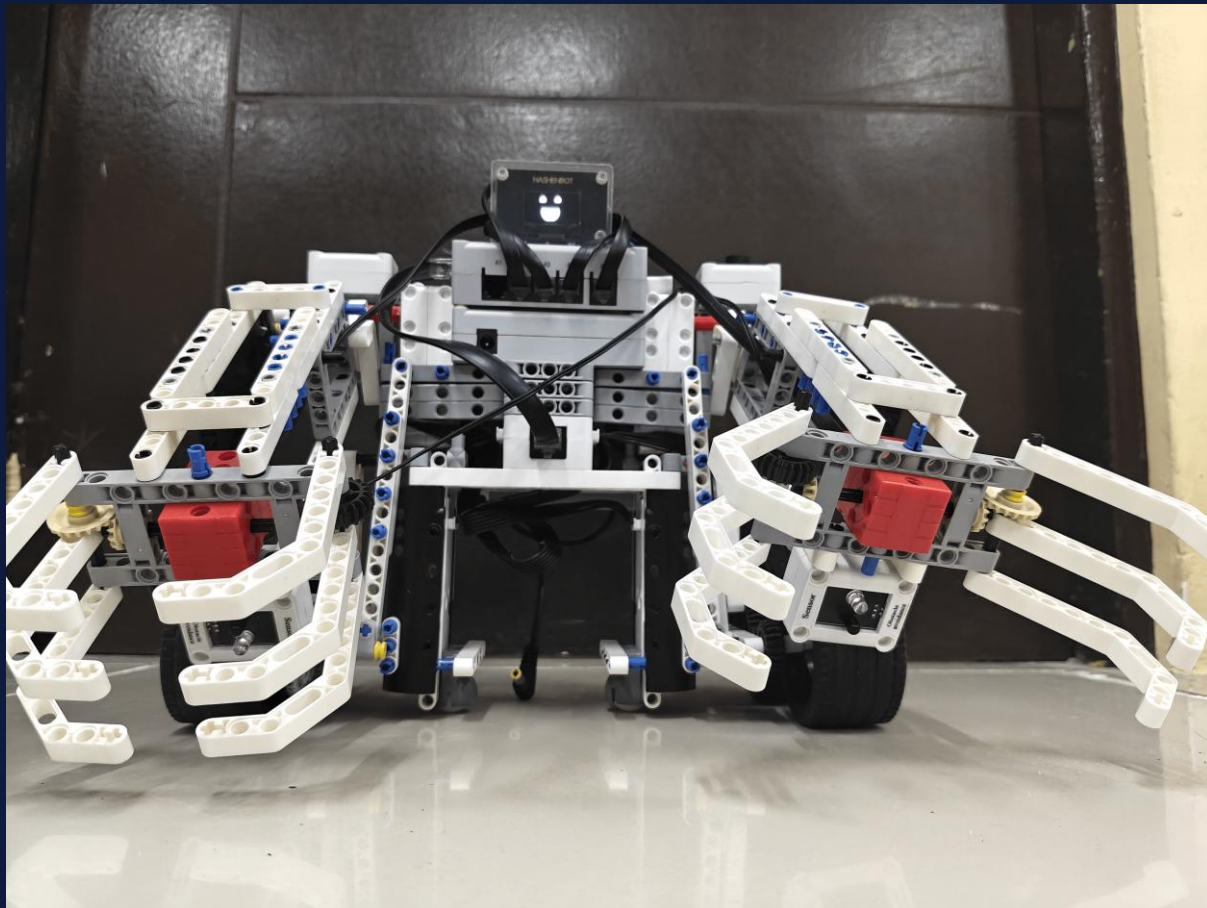
The claw system was directly designed for plastic waste retrieval — connecting the engineering work to a globally recognized environmental problem.

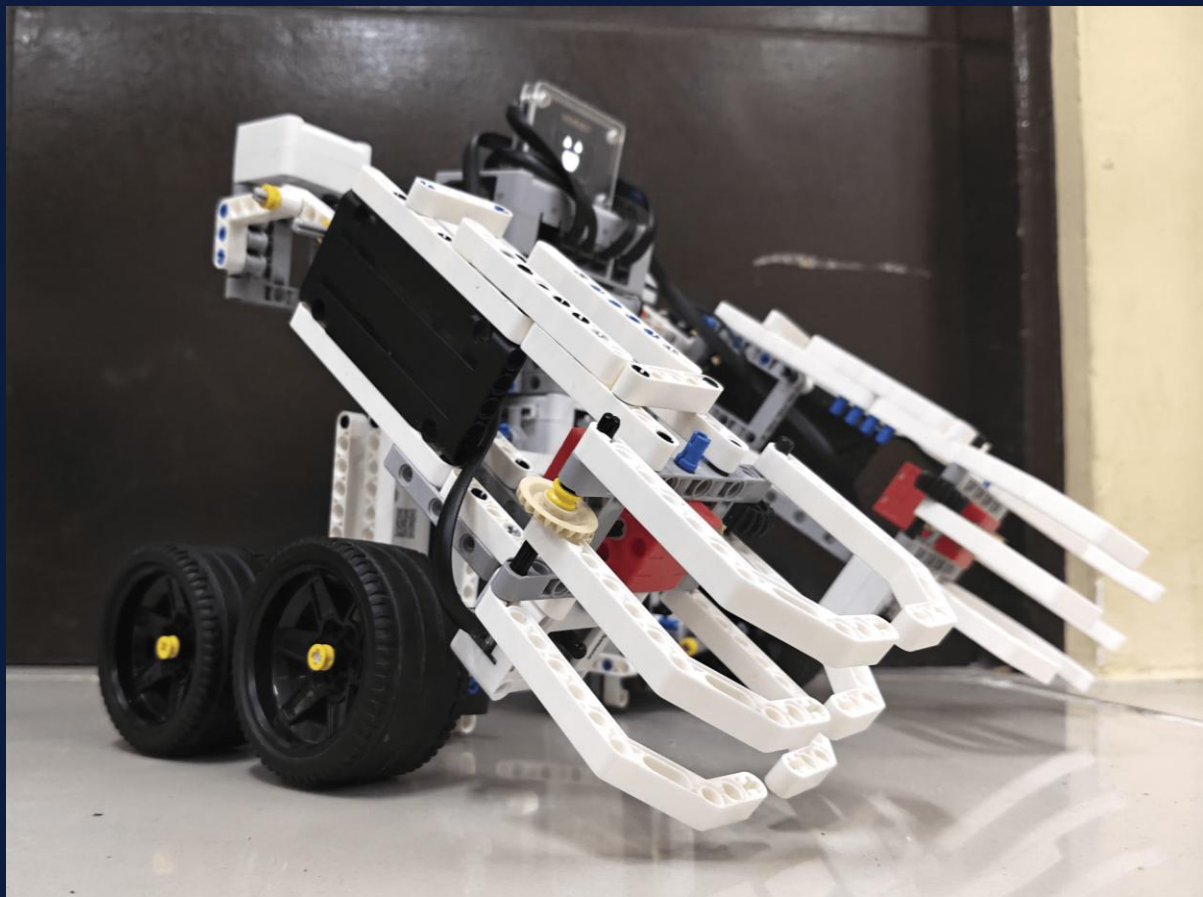
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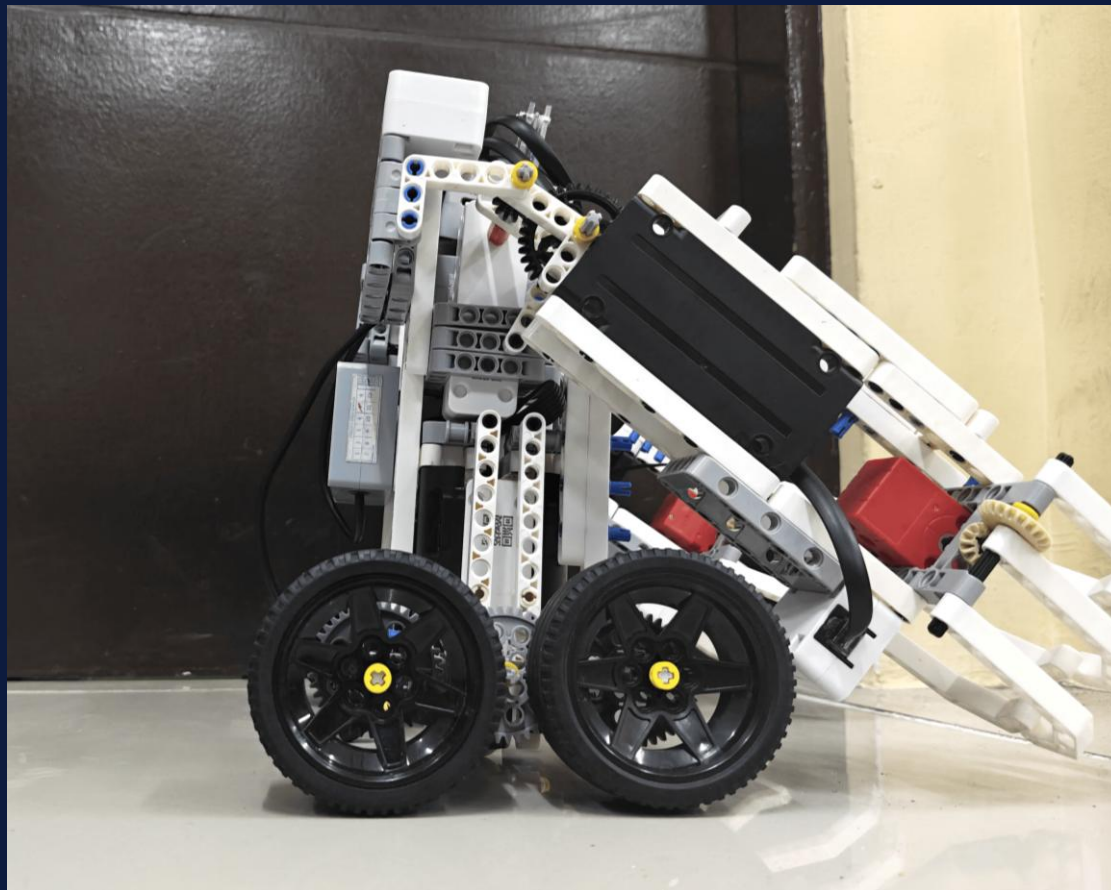
Low-Cost, High-Impact Design

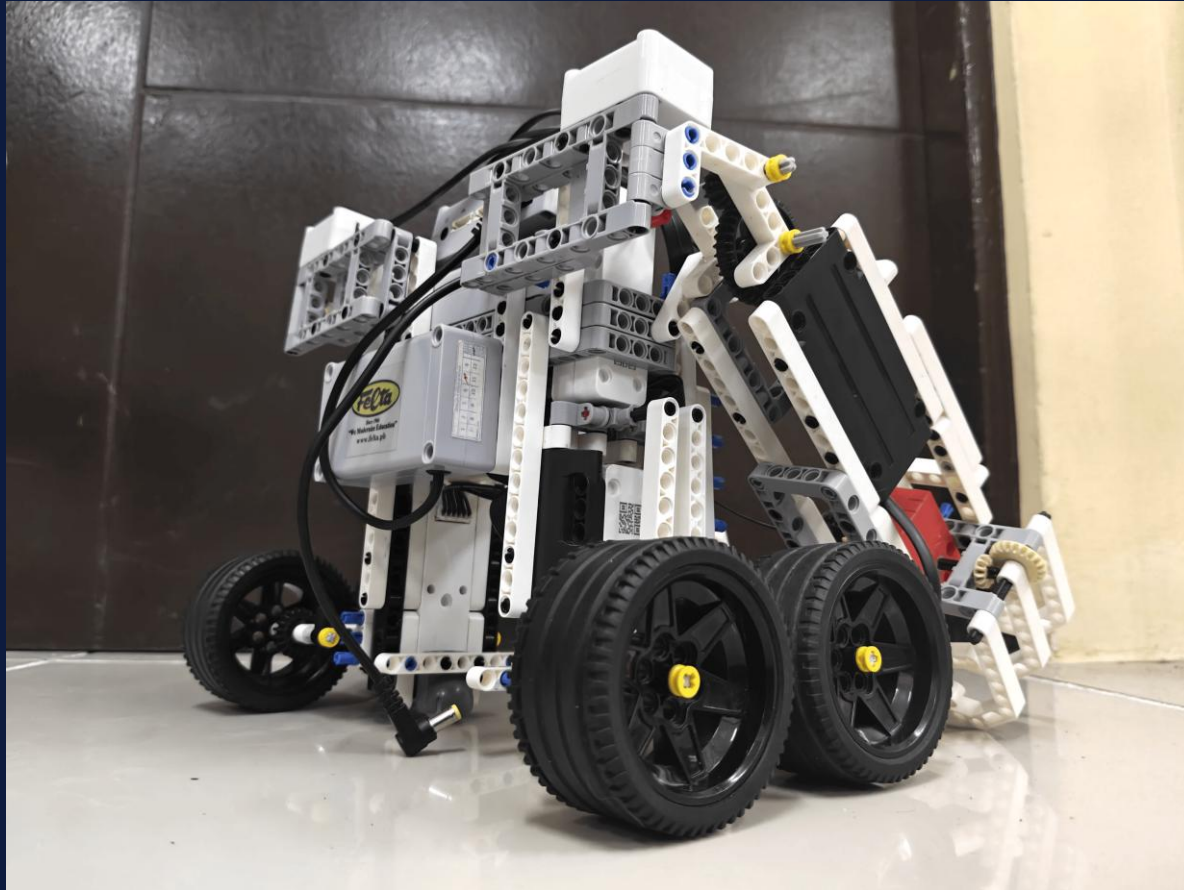
Built from accessible, affordable building blocks — proving that effective, functional robotics solutions do not require premium hardware or industrial budgets.

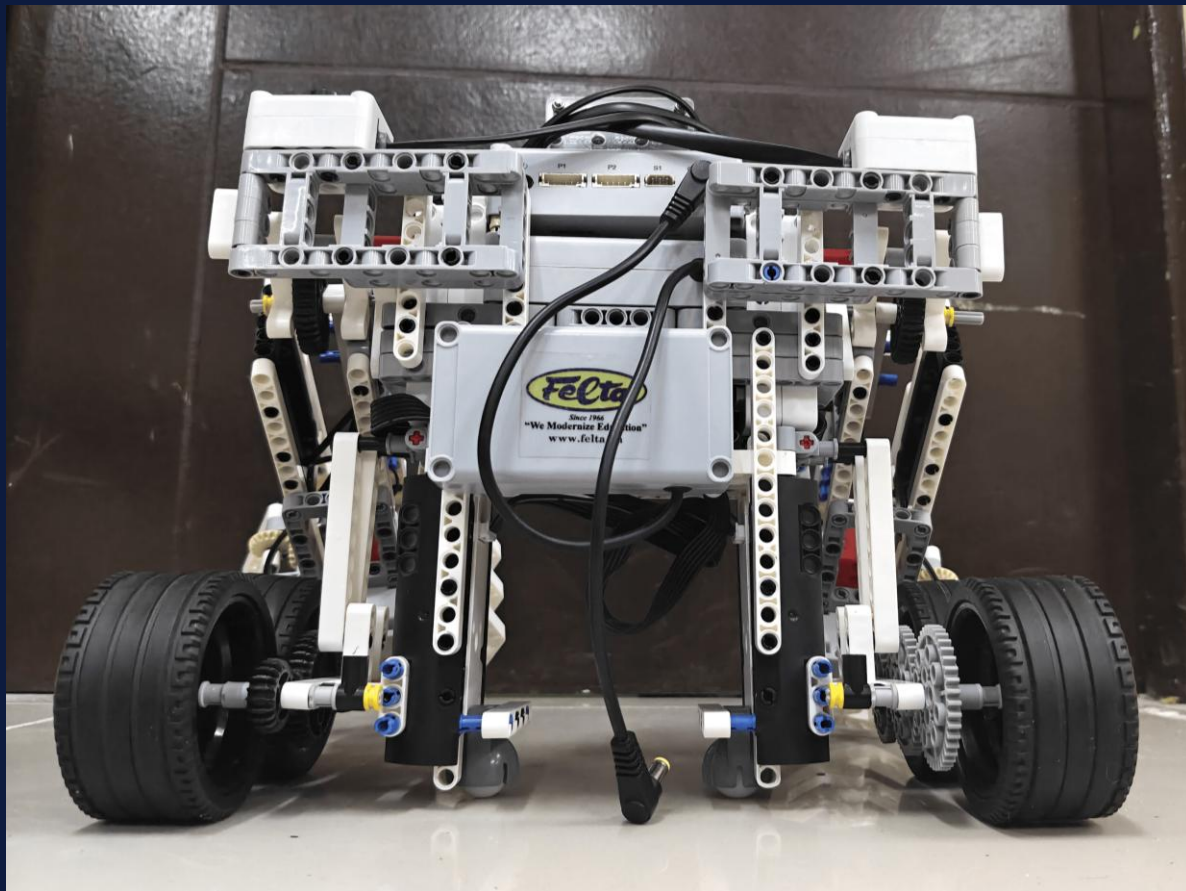








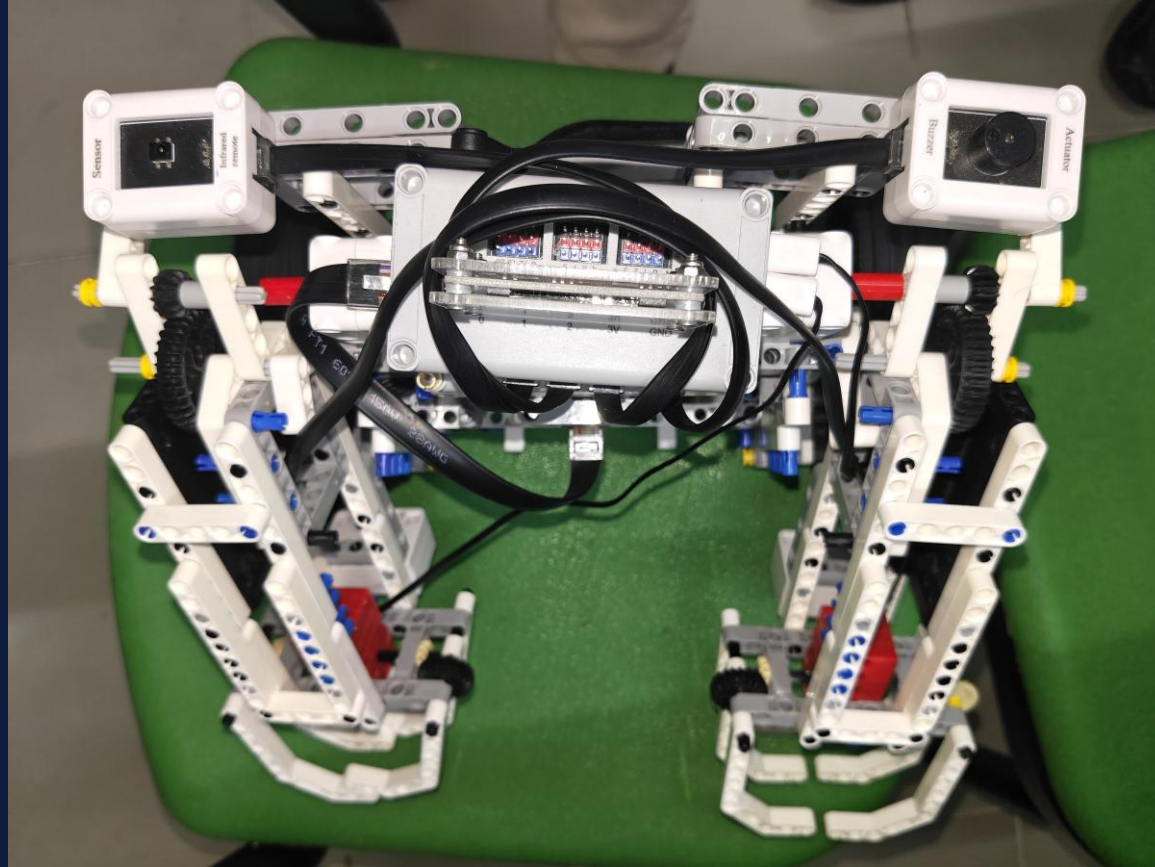


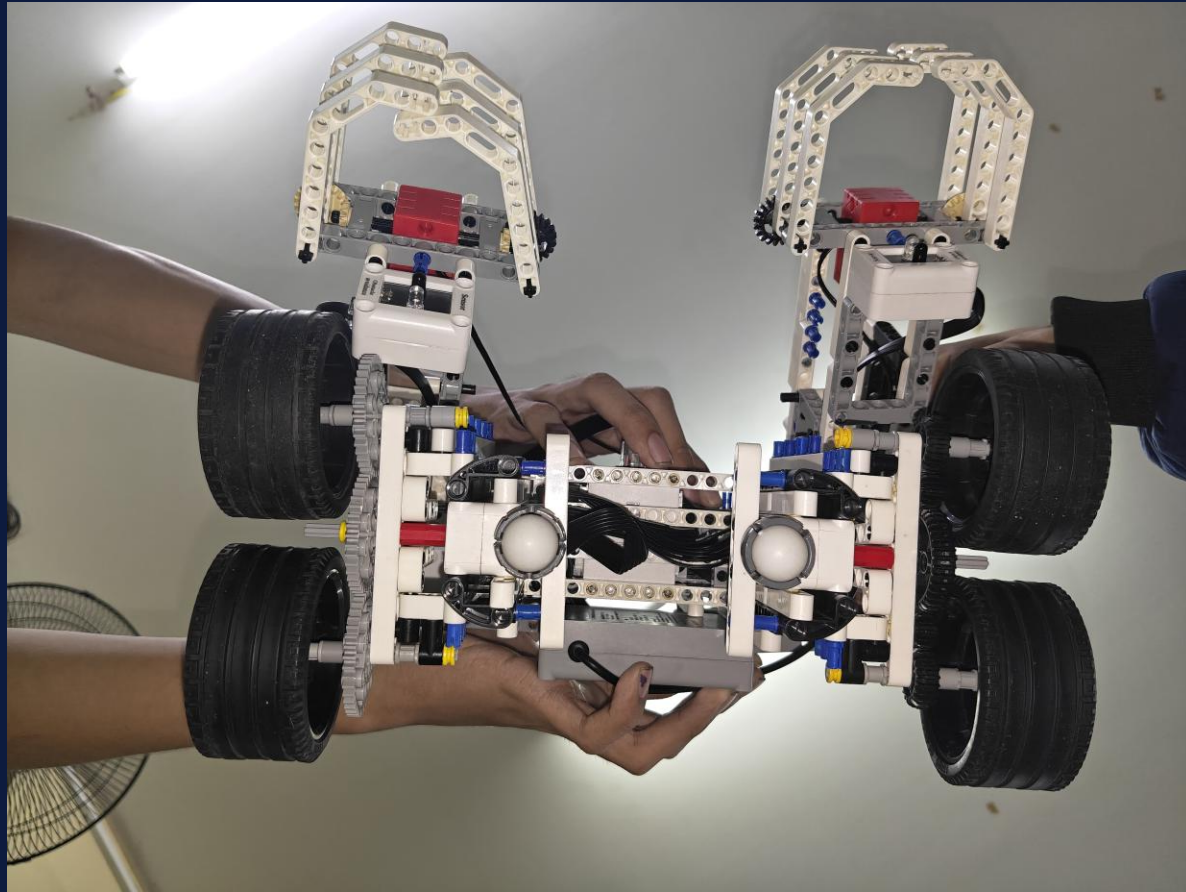












36

CONCLUSION & VISION

H.E.L.P.E.R. demonstrates that thoughtful design, teamwork, and a clear sense of purpose can produce a robot that is not just technically capable — but genuinely meaningful.

Built to lift, push, and entertain — H.E.L.P.E.R. represents our team's commitment to solving real problems with accessible technology.

Our vision is for robots like H.E.L.P.E.R. to eventually serve communities worldwide — in schools, in neighborhoods, in places where a helping hand makes all the difference.

H.E.L.P.E.R.

*Humanoid Experimental
Lifter, Pusher and
Entertainment Robot*

Modular Design

Dual-Mode

Sensor-Smart

Expressive

Eco-Focused

Affordable

Philippine Entry — GAR International