# Surajdroid (Ramudroid v7 Solar Powered)

altanai
Dec 9, 2018 · 5 min read

Ramudroid is an ingeniously build robot to clean outdoors and alleys(gullies) inspired by Bharat Swachhata Abhiyaan . The idea is to tackle the problem of litter and trash alongside roads and lanes by using 3 brush system to target and lift small objects like plastic cups, wrappers, leaves etc. Read more
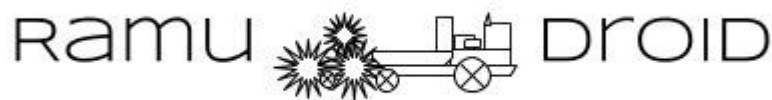

Ramudorid v7 is powered by solar energy, it uses camera's media stream to identify target garbage type and 3 brush design to lift up small objects like plastic cups, wrappers, leaves etc. The **autonomous** droid also provides real time camera stream and detects obstruction to reroute itself. It can communicate over 4G, WiFi and BLE and uses edge computation to collect and analyse data on garbage spotted and collected.
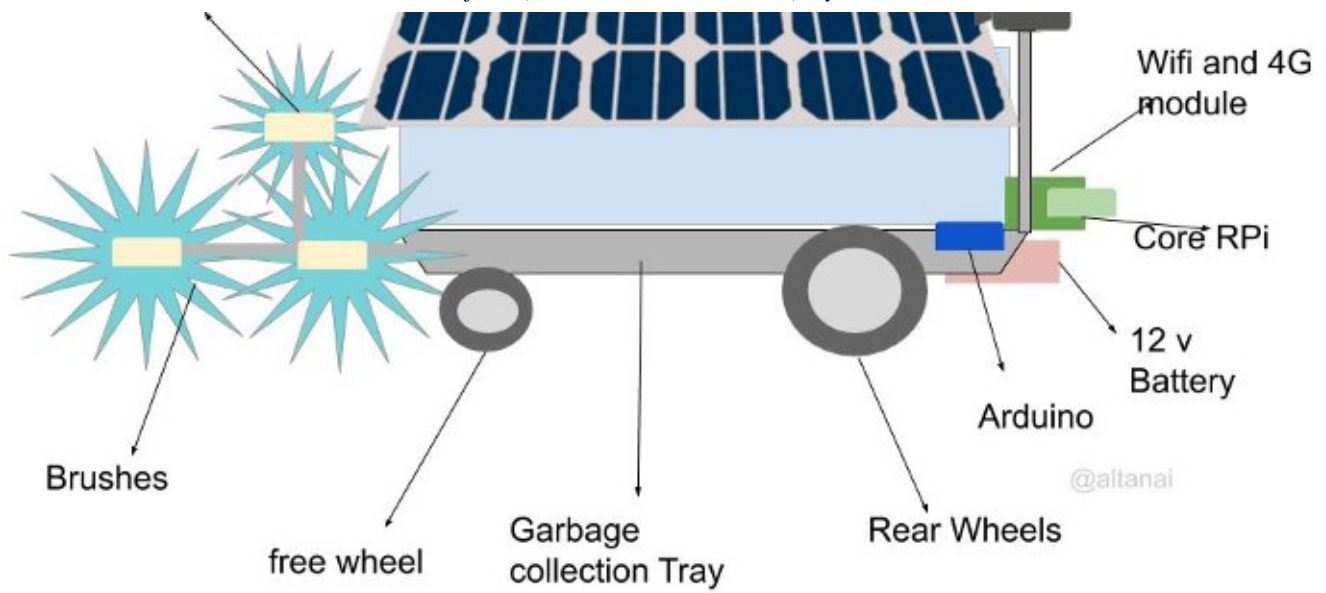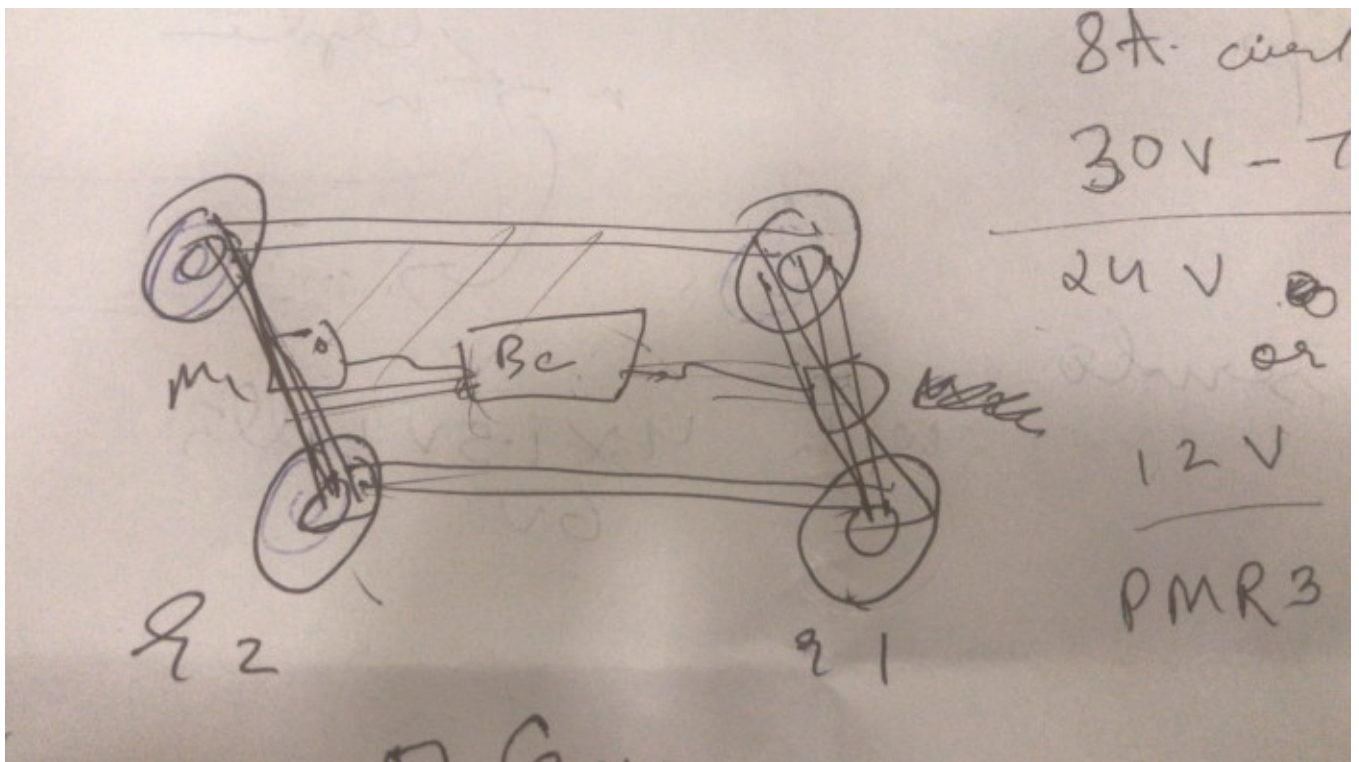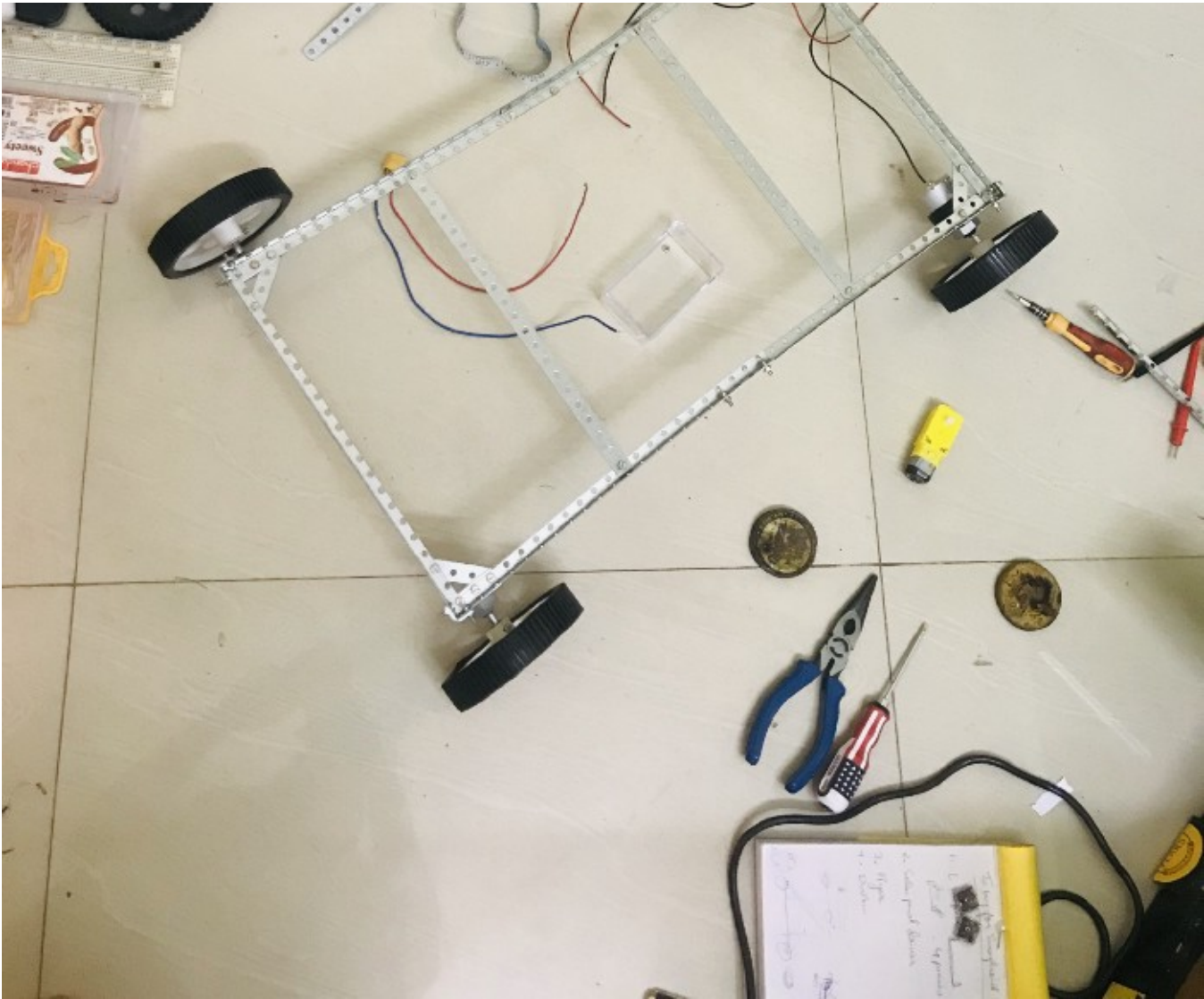
Ramudroid v7

Prototype in Development

Frame and wheel

Algorithm Enhancements

- Obstruction Detection

- Stop Operation on Tray Weight reaching threshold

- Pause operation and take Shelter in Rain

Equipment Cost

Power And Charge Devices

1. Solar Panel MicroSun MS 12v 60 WP — 2500 INR

2. Solar charger Controller — 600 INR

3. Battery 11.1 V 2200 mAh — 500 INR

Frame and Motion Assembly

1. Wheels 10 cm diameter — 50 INR x 4 ie 200 INR

2. Tray — 400 INR

3. Frame Assembly — 1000 INR

4. Arduino to control Motors Drivers — 500 INR

5. Motor Driver — 300 INR

6. LCD display — 200 INR

Electronics , Communicating modules and Sensors

1. Raspberry Pi Moddel B+ — to be replaced with low cost alternative — 2700 INR

2. GPS module — 700 INR

3. GSM module — 1400 INR

4. Camera 5 MP Board Module — 450 INR
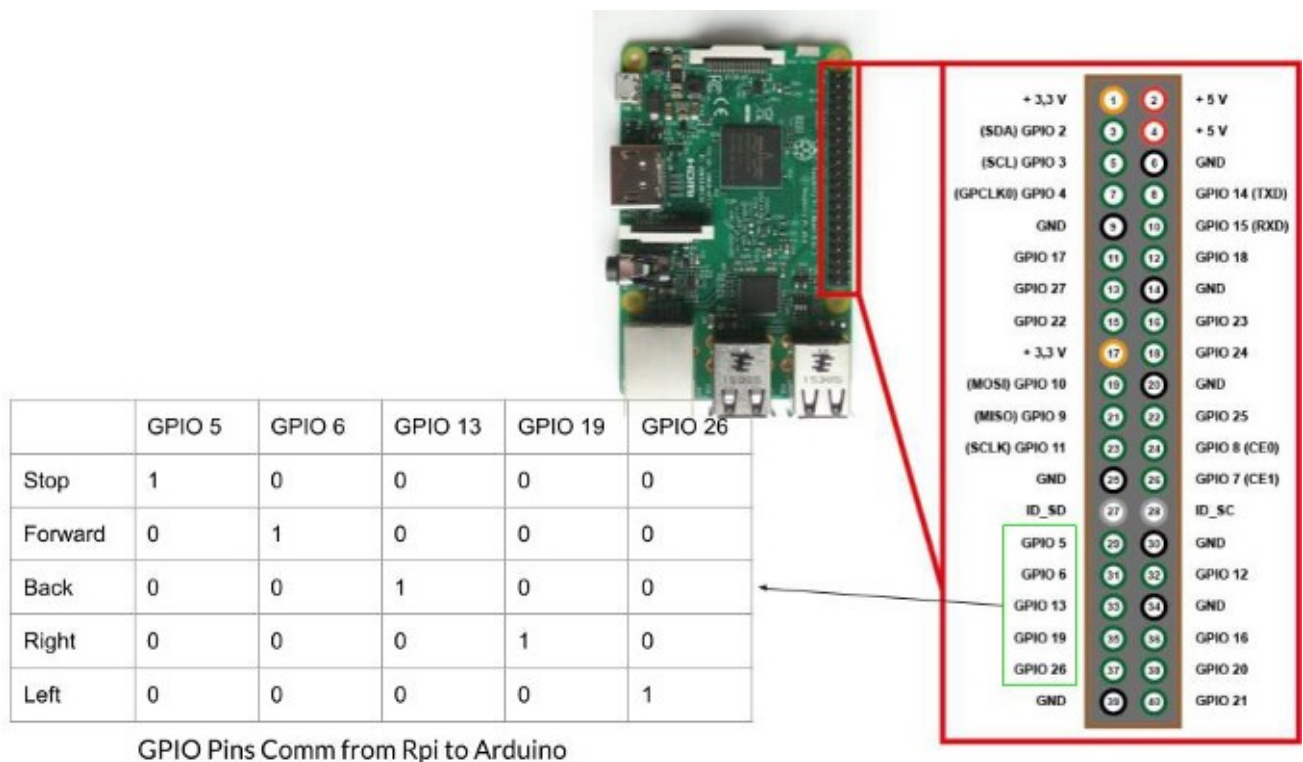
Total Cost to Develop — 12000 INR

Working Principle

The robot is divided into 2 parts — Cleaning Unit and driving unit

Driving Unit

consists of 4 wheel to drive the setup . Wheels must be tightly fixed into position to prevent them from tilting, spreading outwards and balancing the load. 2 rear controller by 12 V 1 amp DC motors with 300 RPM and 2 front free wheels. Motors are connected to Arduino for receiving command for start , stop , left or right navigation.

There are three input pins for each motor, including Input1 (IN1), Input2 (IN2), and Enable1 (EN1) for Motor1 and Input3, Input4, and Enable2 for Motor2.

	GPIO 5	GPIO 6	GPIO 13	GPIO 19	GPIO 26
Stop	1	0	0	0	0
Forward	0	1	0	0	0
Back	0	0	1	0	0
Right	0	0	0	1	0
Left	0	0	0	0	1

GPIO Pins Comm from Rpi to Arduino

Cleaning Unit

Uses 3 tough bristled brushes controlled by 3 5V DC gear motors with 60 RPM. The arrangement of the brushes is such that the bottom 2 brushes use clockwise and anticlockwise motion outwards to pull in the litter and push up with the flow of the air and bristles of the brush. The third brush combs the collected into the collector tray. The tray is attached to weight control system to stop operations when critical weight is reached to prevent overloading the robot

Object Detection and Garbage spotting using opencv filters on live stream

Ramudroid v7 - Solar Powered , Webrtc Streamin…

Solar specification

- Maximum Power (Pmax) — 60 Wp

- Voltage at Maximum Power (Vmpp) — 18.1 V

- Current at Maximum Power (Impp) — 3.32 A

- Open Circuit Voltage (Voc) — 22.32 V

- Short Circuit Current (Isc) — 3.63 A

- Standard Test Conditions (STC): air mass AM 1.5, irradiance 1000W/m2, cell temperature 25°C

- Maximum System Voltage 1000 V

Electrical Data at NOCT

- Temperature — 47±2 °C

- Nominal Operating Cell Temperature (NOCT): 800W/m2, AM 1.5, windspeed 1m/s,

- ambient temperature 20°C

Thermal Ratings

- Operating Temperature Range -20~90 °C

- Temperature Coefficient of Pmax -0.43 %/°C

- Temperature Coefficient of Voc -0.36 %/°C

- Temperature Coefficient of Isc 0.66 %/°C

Material Data

- Panel Dimension (H/W/D) 705x655x35 mm

- Weight 6 kg

- Cell Type Polycrystalline

- Cell Size 156×156 mm

- Cell Number 36

- Encapsulant Type — EVA (Ethylene vinyl acetate)

- Frame Type Anodized Aluminium Alloy

Physical
Dimentions — 70mm x 655mm x 35mm
cells per module — 36
cell type — poly crystalline sIlicon
fuel cell dimention — 156mm x 156mm
Encapsulation — EVA
back cover — PV sheet

Ref : https://www.enfsolar.com/pv/panel-datasheet/crystalline/20863

Load

Solar panel weight — 5kg with anodised alumium frame , 3 kg without the frame with just the toughened texture glass on panel
Frame and wheels — 2kg
Accessories — 1 kg
garbage holding capacity — 2 kg
Total Weight of the Robot : maximum upto 10Kg

Communication

Scenarios

Good Sunlight scenario : This 12 Volt solar panel provide about 2.5 Amps of current on average during daytime. In such a situtaion it is directly used to drive the machine's motors for wheels and brushes and electrical components such as PI and arduino. In no motion of rest conditions the genrated power is used to charge the attached backup battery.

Shady / evening / morning scenario : When the panel is not receiving direct or strong sunlight, the power generated is less hence not sufficient to take the load of driving the wheels for movement. Hence is the power falls below a certain prespecified threhold, the current is drawn from battery backup.

Night / No sunlight Scenario : battery is used to power the setup. panel can be dismounted to lower the load.

Contributing to Ramudroid Project or Reuse

It is deigned and developed as an Open-source product by a bunch of developers and engineers in Bangalore for cleaner environment.

altanai/Ramudroid

Ramudroid is a bot to clean roads and outdoor environments. It is battery-powered. For brains, there's a Raspberry Pi…

github.com

RamuDroid

The purpose of this Droid is to clean roads and outdoors for a better and cleaner India. It works on the principle of…

hackaday.io

. . .

Originally published at http://telecom.altanai.com on December 9, 2018.

Ramudroid   Robotics   WebRTC   Raspberry Pi   Arduino

About   Help   Legal

Get the Medium app

A button that says 'Download on the App Store', and if clicked it will lead you to the iOS App store

A button that says 'Get it on, Google Play', and if clicked it will lead you to the Google Play store