

Robot Vacuum Cleaner

Since several years robotic vacuum cleaners (RVC) are available. An RVC is capable of cleaning the floors of a house in autonomous mode.

An RVC system is composed of the robot itself and a charging station. The charging station is connected to an electric socket in the house, and allows charging the battery on board of the robot.

The robot itself is composed of mechanical and electric parts, a computer, and sensors. One infrared sensor in the frontal part recognizes obstacles, another infrared sensor always on the frontal part recognizes gaps (like a downhill staircase). A sensor on the battery reads the charge of the battery. The computer collects data from the sensors and controls the movement of four wheels. Another sensor on one of the wheels computes direction and distance traveled by the robot.

Finally on top of the robot there are three switches: on-off, start, learn.

The learn button starts a procedure that allows the robot to map the space in the house. With a certain algorithm the robot moves in all directions, until it finds obstacles or gaps, and builds an internal map of this space. By definition the robot cannot move beyond obstacles, like walls or closed doors, and beyond gaps taller than 1cm.

The starting point of the learn procedure must be the charging station. When the map is built the robot returns to the charging station and stops.

The start button starts a cleaning procedure. The robot, starting from the charging station, covers and cleans all the space in the house, as mapped in the 'learn' procedure.

In all cases when the charge of the battery is below a certain threshold, the robot returns to the charging station. When recharged, the robot completes the mission, then returns to the charging station and stops

Business Model

Stakeholders

Context Diagram and Interfaces

Actor	Physical Interface	Logical Interface
User		
Power Supply		

Requirements

System

- Clean up a space autonomously
 - move covering the whole space
 - clean
 - avoid obstacles
 - recognize and avoid humans and pets

Non Functional

- Flat space
- Min 80 sqm to be cleaned
- No harm to humans and pets
- Cost < 300 €

- recharge in < 2 hours

Robot

Robot Design

- Infrared sensor for obstacles
- Infrared sensor for gaps
- Battery
- Sensor on the battery
- 4 wheels
- Electrical engine on 2 wheels
- Vacuum pump
- Switch to set pump on/off
- Computer and firmware

Computer and firmware

Functional Requirements

Robot FR

- Clean
- Move covering the whole space
- Avoid obstacles
- Recognize and avoid humans and pets

Software FR

- Set pump on/off
- Manage energy