NASA LEC Robotic Mining

1.0

Design Documentation

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1 Interfaces with adjacent systems

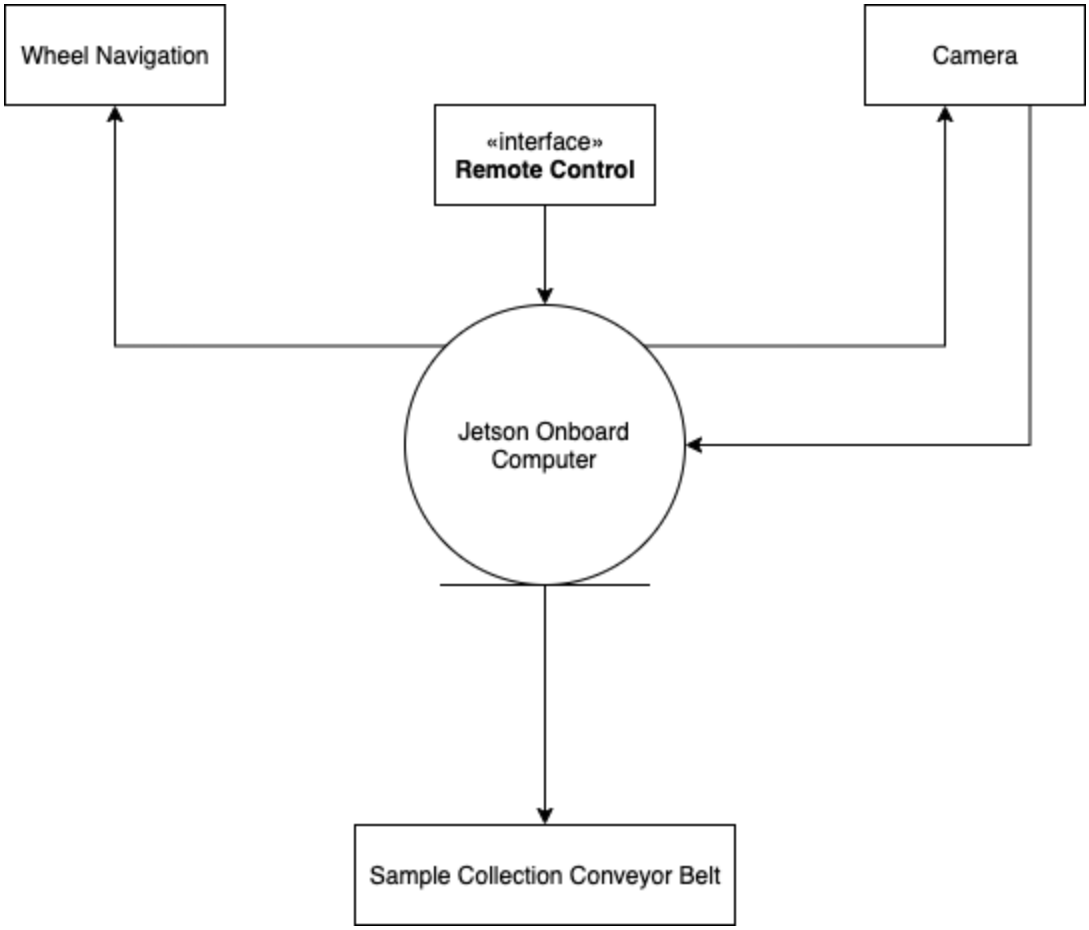

Figure 1 - Manually Controlled System Context Diagram

Figure 1 shows how the Jetson Computer is the main source for controlling the subsystems. A remote control operated by us manually is used to give the Jeston inputs, which then coordinates with a subsystem to move or operate the robot in different ways. The Jetson could move the wheels, move the arms, and turn the conveyor belt on or off. The camera also gives information to the Jetson to help with navigating the obstacle course and find places to mine.

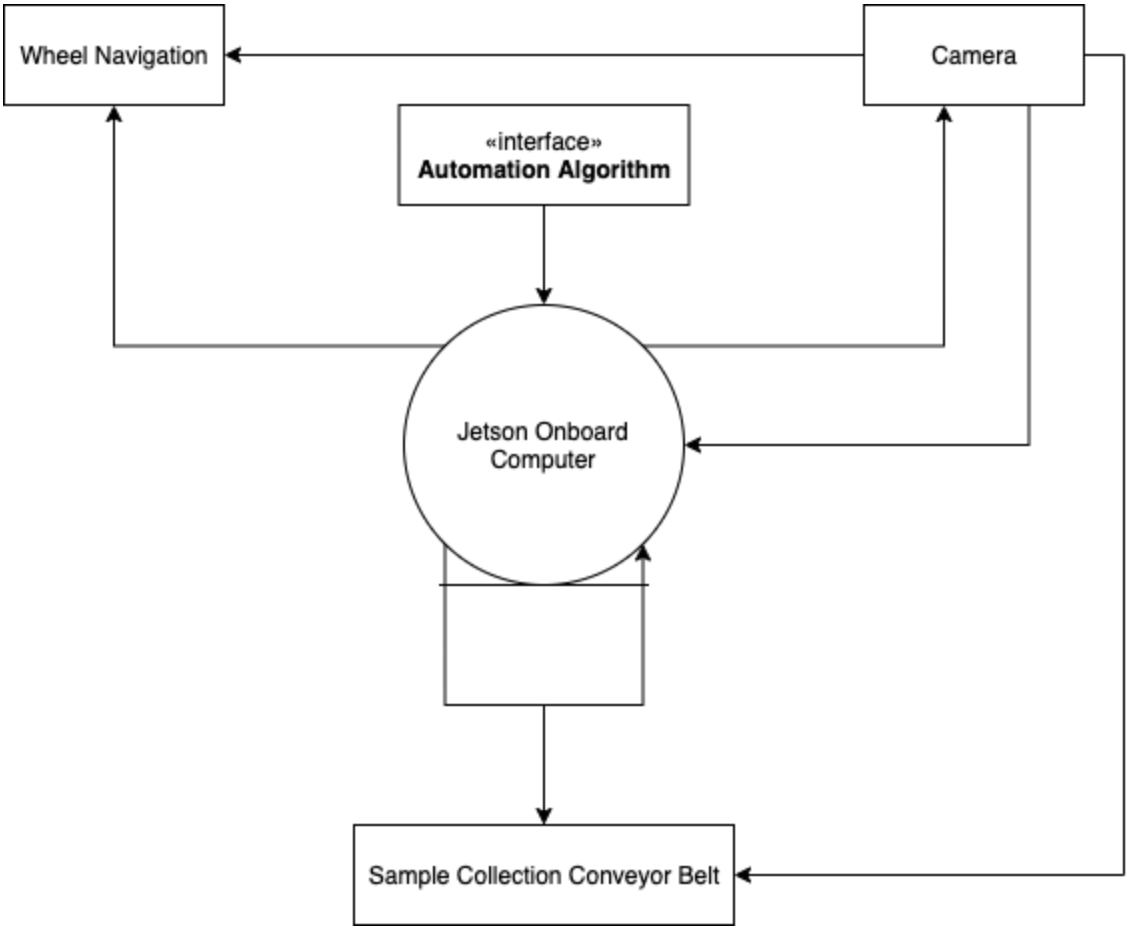

Figure 2 - Automated Controlled System Context Diagram

Figure 2 shows how the robot would work under automatic controls. The Jeston takes input from our automated controller, and controls the different subsystems. The automated controller gives information about the robot's surroundings and gives proper output to move the robot or start the mining process. With automation, the camera is the main way for the robot to figure out how to operate. The camera, in combination with the automation algorithm, figures out where the robot needs to go and how to go there without getting stuck or hitting an obstacle.

2 System Life Cycle Designs

2.1 Subsystem Designs

2.1.1 Wheel Navigation

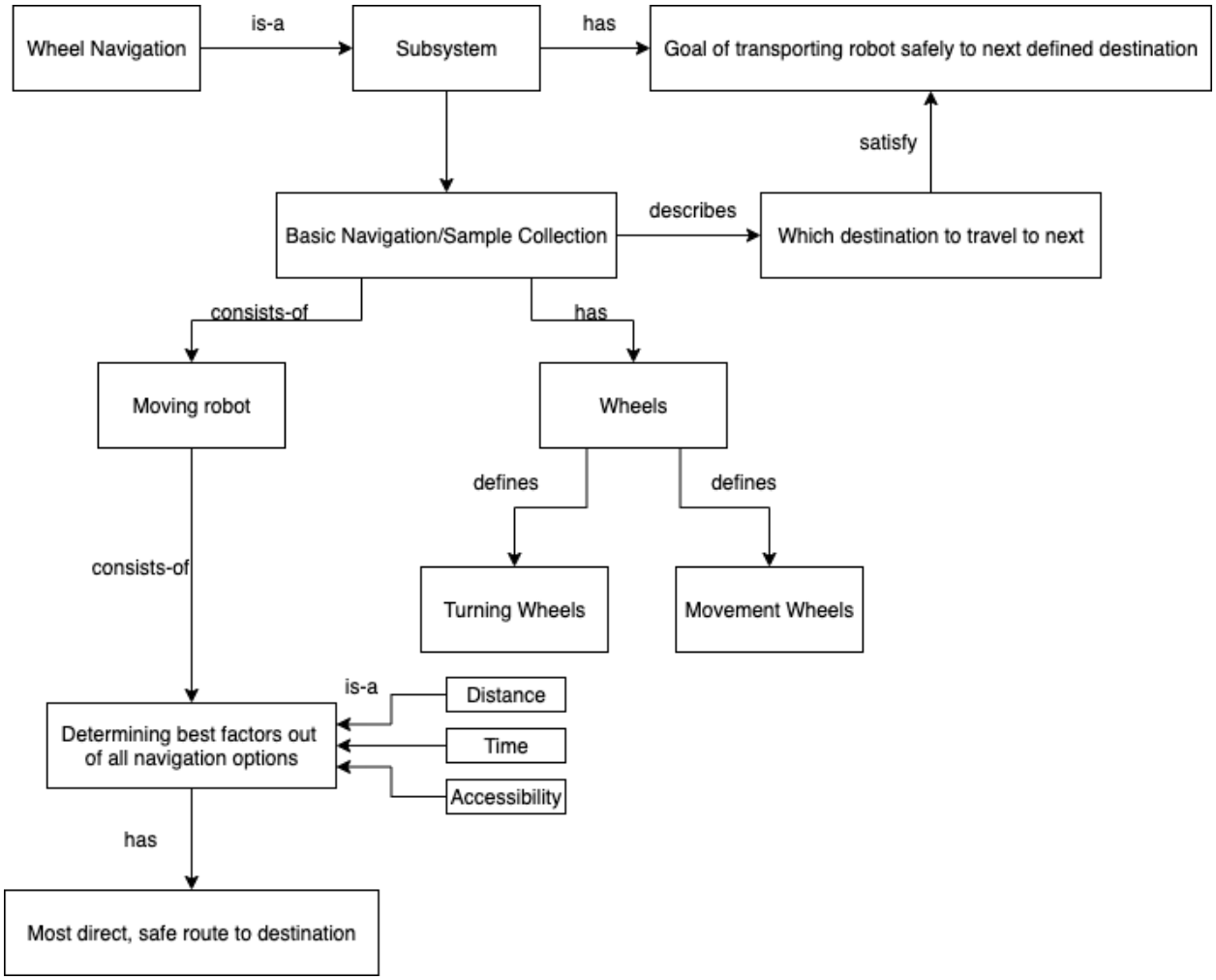

Figure 3 - Wheel Navigation Use Case Structure

Wheel navigation is a subsystem of the robot that controls where the robot goes. The robot has four wheels that can turn left and right, and roll forward and backward. When the robot is moving, navigation is determined by the closest distance, fastest time, and easiest accessibility to get the robot to the destination most effectively. The wheels main goal is to move the robot to the destination in the best way possible.

2.1.2 Camera

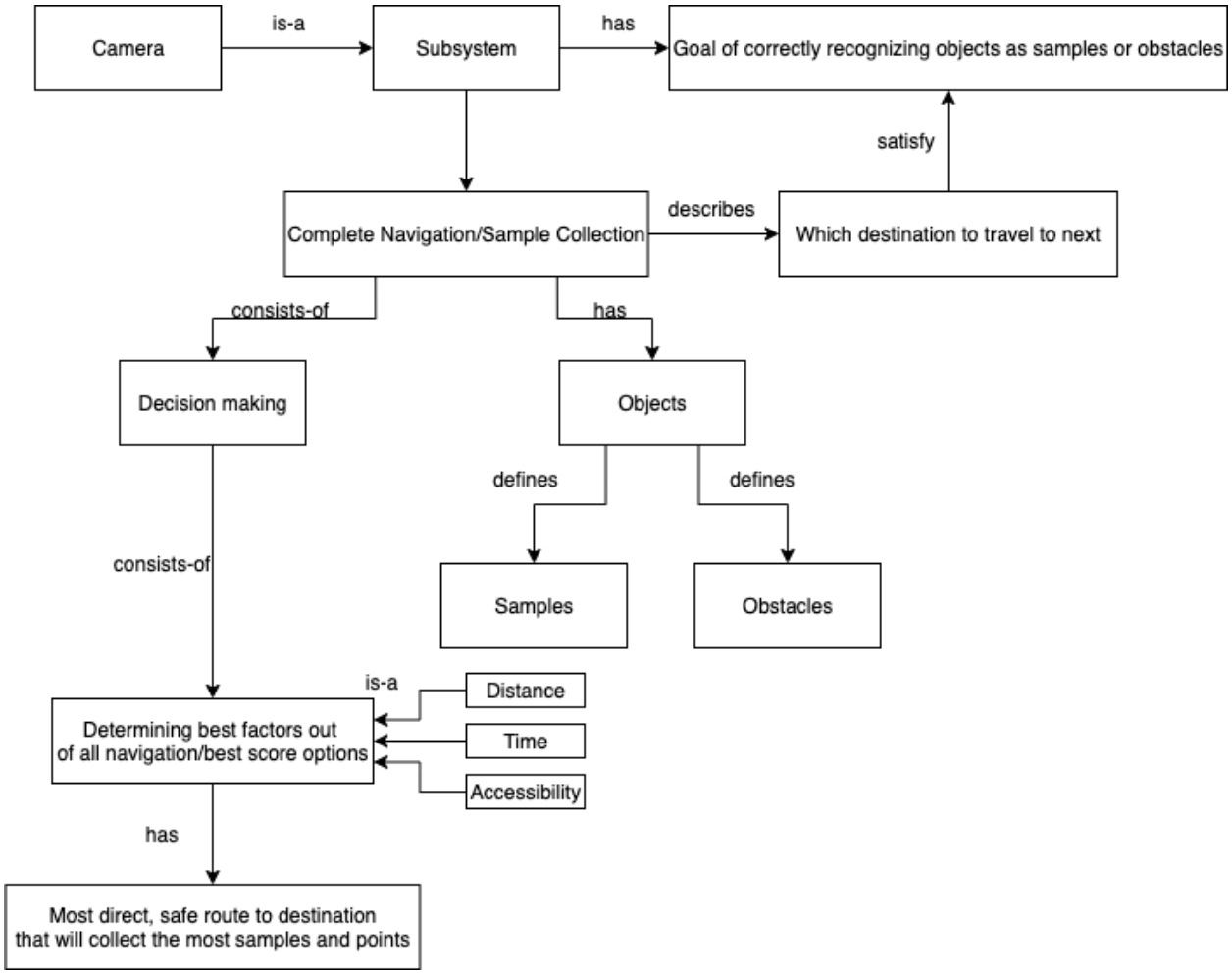

Figure 4 - Camera Use Case Structure

The camera is a subsystem of the robot that determines where the robot goes. The camera can detect obstacles and mining areas to determine where the robot should go, and where it needs to avoid. Objects the camera can see are either samples that need to be collected, or obstacles that need to be avoided. The camera is the first step in the automation process to make decisions about where the robot needs to go. This process helps to figure out the best way for the robot to move.

2.1.3 Sample Collection Conveyor Belt

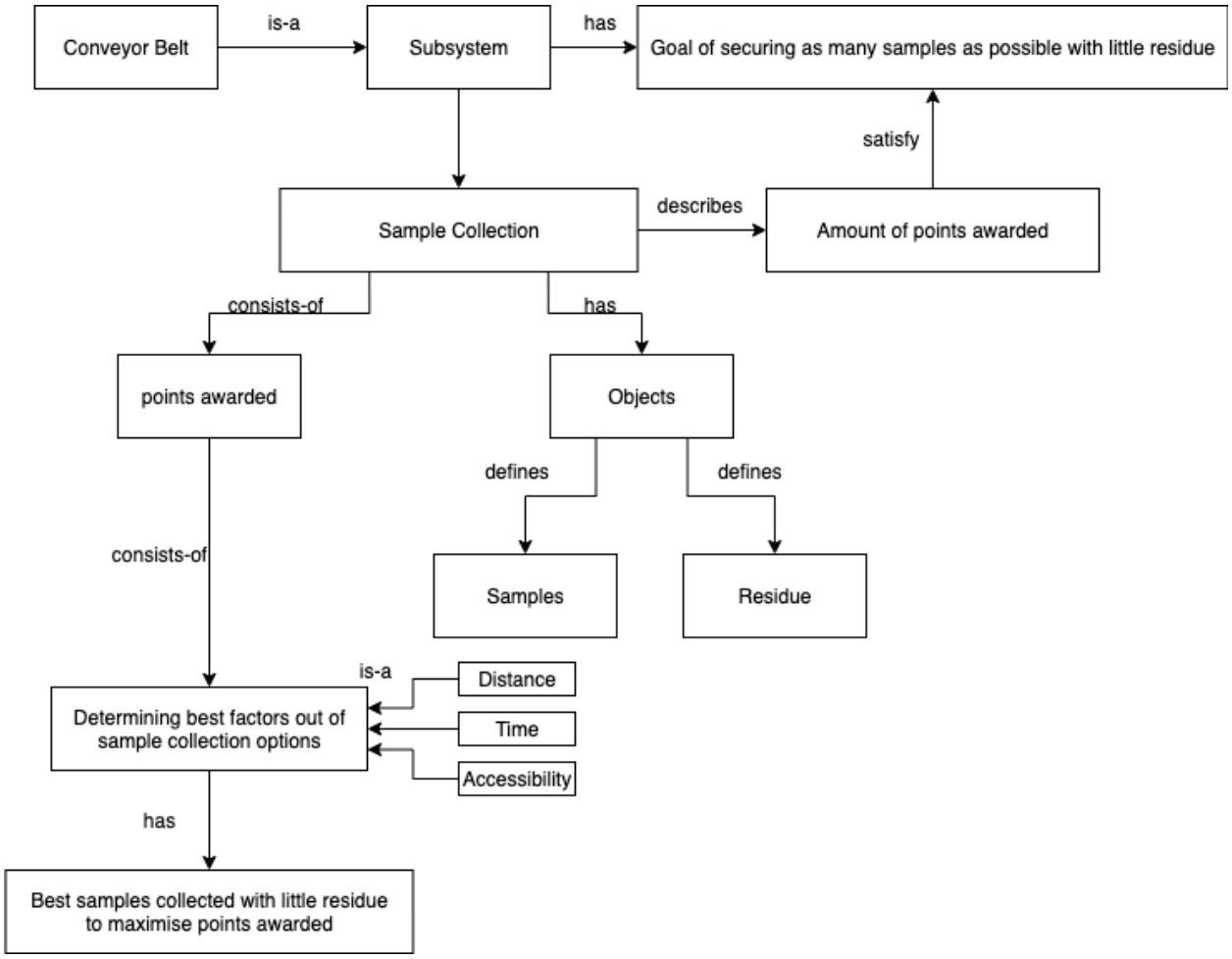

Figure 5 - Sample Collection Conveyor Belt Use Case Structure

The conveyor belt is a subsystem of the robot that controls the mining process. Mining different samples can award varying numbers of points. The point values of different samples determines which samples need to be gathered first. Objects that conveyor belt mines consist of the samples that need to be collected, and residue which should not be collected.

2.1.4 Jetson Onboard Computer

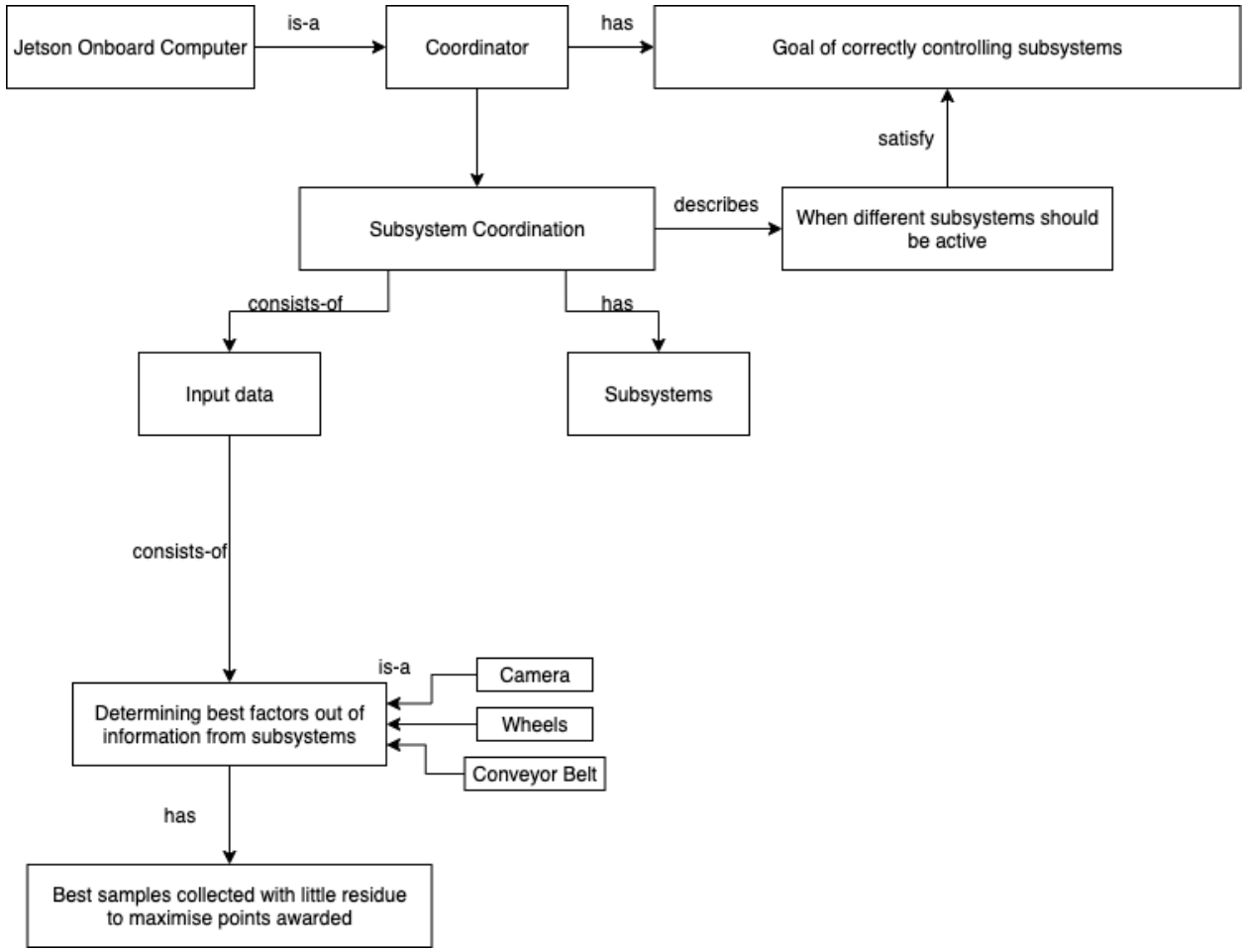

Figure 6 - Jetson Onboard Computer Use Case Structure

The Jetson Computer is the coordinator for the robot. Its goal is to control all of the subsystems properly to get the robot safely from place to place. Coordination from the Jetson is when each subsystem is active and what each subsystem does. Data is given to the Jetson either manually or automatically to help determine the best way to move the robot.