Insert for Section C – Case study

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TURN OVER

Bella and Scott are working on an innovative solution design for a new type of robotic vacuum cleaner. They have seen a lot of robotic vacuum cleaners on the market that use randomised movements to vacuum floors, and they believe they can create a smarter and more appealing robotic vacuum cleaner that will clean much more efficiently than randomised robotic vacuum cleaners. Scott proposes calling the new system 'RoboMojo'. Bella agrees with the name.

Most robotic vacuum cleaners work using a randomised method of cleaning the floor of a home. Each time the vacuum cleaner hits an obstacle, it changes direction by selecting a random number of degrees to turn before attempting to move forward. This can result in some parts of the floor being cleaned very well, and some parts not at all, as there is no guarantee that the robot will reach all available floor surfaces. Bella believes she can write an algorithm that will allow RoboMojo to clean all available floor surfaces much faster than a randomised approach.

To make RoboMojo a little bit more exciting to consumers, Scott has suggested that they also program the vacuum cleaner to respond to the types of materials it cleans up off the floor in humorous ways. He would like the top panel of the vacuum cleaner to be covered in LED lights that will light up to display different emojis depending on what the vacuum cleaner has picked up off the floor. For example, if RoboMojo sucks up pet hair, Scott thinks it should display a smiley face with its tongue poking out, and if it cleans up spilled water, it should display a crying face. He's already purchased the LED lights that he wants to use.
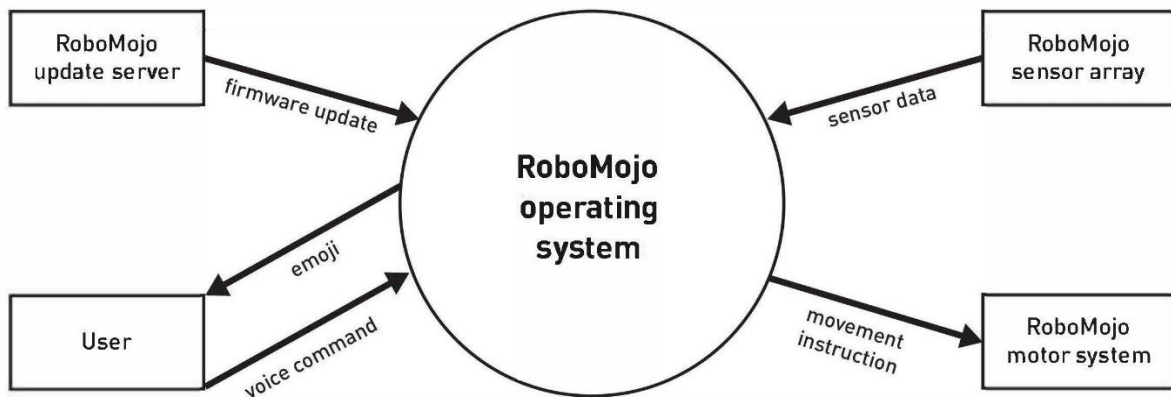
Bella would like RoboMojo to be more user-friendly, particularly for people with accessibility needs. Most robotic vacuum cleaners are controlled using a small remote control or by interacting directly with the unit itself. Bella would like to incorporate voice activation so that RoboMojo can be operated hands-free. It would simply respond to an activation key phrase, such as 'Hey, RoboMojo', and then process any further spoken commands that match an internal database of valid commands.

Bella and Scott want to have the analysis, design and development stages of the robotic vacuum cleaner system completed within the next six months, which is all the time their budget will allow.

Bella creates a context diagram for the RoboMojo operating system. A partial version of the context diagram is shown below as Figure 1. The data flows and processes represented are:

• Data is received from the RoboMojo's sensor array, which matches the materials to an emoji and displaying the emoji to the user.

• Voice commands are received from the user and signals are sent to the RoboMojo motor system.

• Firmware updates are received from the RoboMojo update server via wi-fi.

• All processes are recorded in an operations log.

Figure 1: Context diagram for the RoboMojo operating system

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