PM Assignment #1: Determining Tasks and Creating an ARAM
Due: Tuesday, 9.6.22, by 11:59 pm

Scenario

You're employed by a start-up company backed by Amazon called RobotsRUs which invents and develops programmable robots. Your supervisor has asked you to take over as the project manager for a high-profile project because the original project manager left the company. You'll need to deliver a prototype of a home service robot called RoboHome programmed to perform several tasks and directed by voice control via an Amazon Echo. Thus far, the project team has created a work breakdown structure (WBS). The next step is to determine the tasks required to complete each work package and to create an ***augmented*** responsibility assignment matrix (ARAM) based on the WBS and the tasks. A RAM just includes work packages, but your ARAM will include all the tasks needed to complete each work package. The robot has already been designed, so the project only involves building the programmable hardware prototype, programming the tasks, and developing or installing the necessary software.

Background Information

Project deliverables:

- Programmed robot prototype
- RoboHome App for iPhone cell phone
- RoboHome App for Android cell phone
- Alexa Skill app for the Amazon Echo
- User Guide

Requirements for robot:

- Answer front door
- Get mail from outdoor mailbox
- Provide massages
- Pick up clothes from floor and place in laundry hamper

Resources:

- Assume you have sufficient company funds to purchase the necessary hardware
- Project personnel: **One fulltime computer engineer (Armen), one fulltime electrical engineer (Emma), two fulltime software development engineers (Kirti and you), one fulltime technician (Scott). *All five personnel should be used as resources*.**
- Company computers and printers including a 3D printer

Timeframe:

- The project must be completed within six months

Assumptions:

- RoboHome doesn't have to negotiate any stairs
- Robot arms and "hands" are available in house, i.e., you don't have to build them

How the RoboHome system works:

1. Amazon Echo waits for commands
2. Alexa Skill recognizes command
3. AWS Lambda service receives request from Alexa Skill and publishes it to a Message Queuing Telemetry Transport (MQTT) service
4. RoboHome receives the command from the MQTT service
5. RoboHome performs the task
6. RoboHome cell phone apps are used to provide information to RoboHome, e.g., the height and location of the person waiting to receive a massage

Assignment

- Given the work breakdown structure below, write a list of tasks required to complete each of the work packages highlighted in cyan (recall that a work package is the lowest item on a branch, and each work package results in a deliverable, but not necessarily a project deliverable, i.e., there are a lot more deliverables than there are project deliverables). You should have at least 25 tasks, i.e., a couple for each work package (except, perhaps, for the user manual).
- Create an augmented responsibility assignment matrix (ARAM), i.e., ***a table like the one shown in class***, indicating primary (P) and supportive (S) personnel, and including all the tasks you identified. Be sure to use all five personnel. Note that tasks can be completed by the person responsible for the work package, and you don't have to have supportive personnel for all tasks.

Work Breakdown Structure (WBS), see notes below

WBS #	Description	Responsible	Deliverable
	RoboHome project	Your name	
1	Wire and assemble hardware	Emma	
1.1	Wire and assemble robot base	Scott	Robot base
1.2	Wire and assemble vertical lift circuit (for arms)	Emma	Vertical lift circuit
1.3	Wire and assemble arm controllers	Emma	Arm controllers for both arms
1.4	Integrate circuits (see Fig. 1)	Emma	Robot minus onboard computers
1.5	Install two onboard computers	Armen	Complete robot minus software
2	Software installation	Your name	
2.1	Install robot operating system on onboard computers	Kirti	Functioning robot operating system on two onboard computers
2.2	Install software packages on onboard computers	Kirti	All software packages needed on onboard computers
2.3	Install robotic arm firmware in robot computer	Armen	Firmware installed in robot
2.4	Adapt and install robot task programs on both onboard computers	Kirti	Robot tasks on both onboard computers
3	Program Alexa Skill	Your name	Alexa Skill available via Alexa app
4	Develop phone apps	Armen	Apps for both Apple and Android cell phones
5	Write user manual	Your name	User manual

Notes on WBS:

1. You'll need something in RoboHome to provide power (see Fig. 1 below, but *note that Fig. 1 isn't complete*)—and maybe a motor or two.
2. There's a small robot computer in the base used for the robot firmware (see Fig. 1)
3. You'll need some sort of way for RoboHome to move and some way to control its movement.
4. You'll also need some way to move RoboHome's arms and to know when they've reached a certain height.
5. You'll need lots of sensors for navigating and providing feedback.
6. All components will need to be able to communicate.
7. A camera on RoboHome might be nice.
8. RoboHome needs two onboard computers in addition to the small robot computer, one a development computer and the other a navigation computer. The development computer on RoboHome runs canned motion software and data visualization software. The navigation

computer runs canned navigation software and a program for the hardware drivers and sensor drivers.

9. The programs needed to perform RoboHome's tasks are available for the most part, but they need to be adapted for RoboHome.

Don't Panic Instructions and Other Information

- This assignment is obviously fictitious and reflects the CptS/EE 302 instructor's wishful thinking.
- Use common sense and the notes given for the WBS above to come up with tasks for each work package. **Some work packages listed in the WBS do not require any tasks but exist simply as a work package with a deliverable, e.g., Write user manual.** Imagine the completed RoboHome prototype as you come up with tasks, e.g., what it would need to give you a comfortable shoulder massage (RoboHome isn't meant to be a massage therapist!).
- Try to have some fun with this assignment! There's not a single solution (and Canvas plagiarism software will be used to check for similar solutions; it checks previous semesters!).
- This assignment will be used to complete the next assignment for which you'll use Project Libre.

Assignment Deliverable (upload to Canvas)

- PDF file of ARAM (which is a table with appropriate headings; see example from lecture)

Grading

The grading rubric is available with the homework.

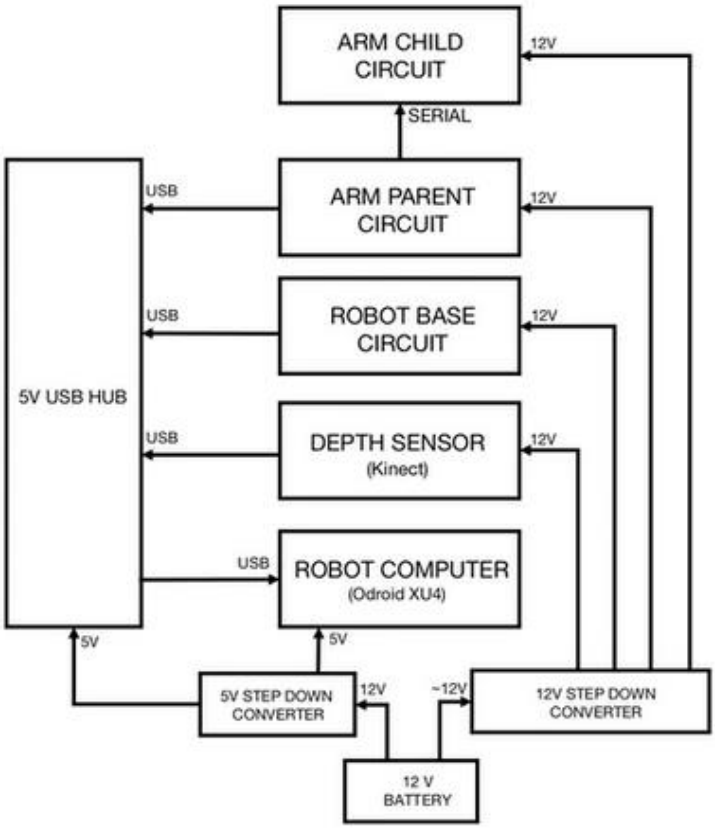

Figure 1. Partial Schematic of Robot Base Circuits