# System Requirements Review

## Robotics Project

**Team D**
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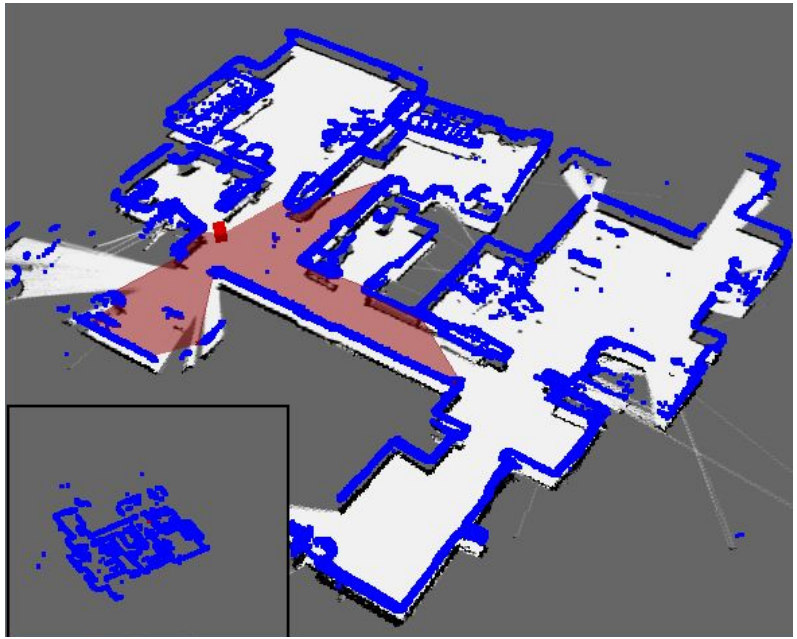
# Problem definition

Simultaneous Localization And Mapping (SLAM)



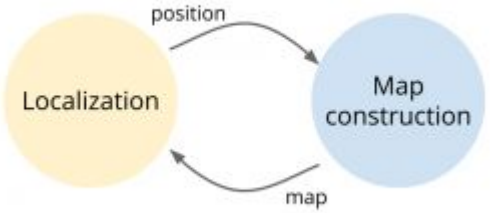



Image retrieved from: http://mapir.isa.uma.es/jotaraul/Resources/Robot@Home-dataset/geometric_maps/buildingMap-fullhouse.png

# Proposed solution

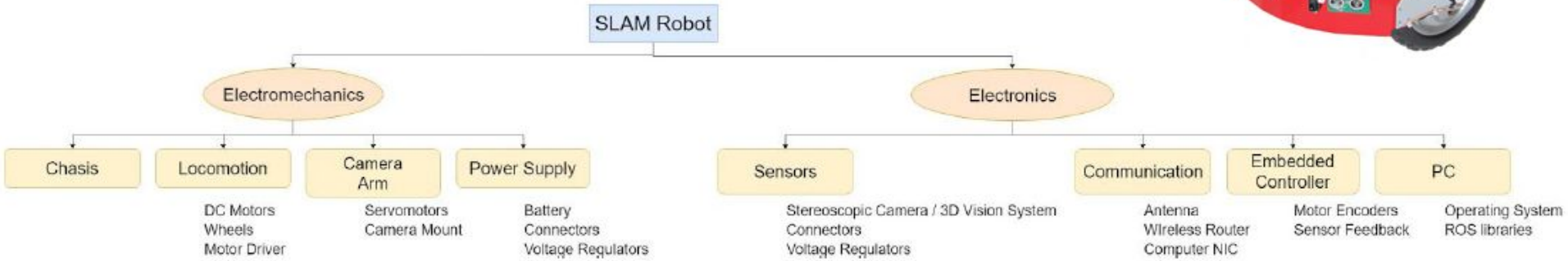



Image retrieved from: [2]

# Requirements overview

**Functional requirements**

*Electromechanics*:

- The robot shall be able to move freely on a plain surface.
- The robot shall be contained in a chassis robust enough to carry all its components around.
- The robot shall be powered by a portable power supply.

*Electronics*:

- The robot shall operate autonomously and wirelessly.
- The robot shall have the ability of scanning its surroundings without directly interacting with the obstacles. It shall, in fact, avoid them.
- The robot shall compute its trajectories and take decisions based on the information gathered from its surroundings.
- The actions of the robot shall be coherent with and faithful to the instructions it computes.

# Design, implementation and testing plan

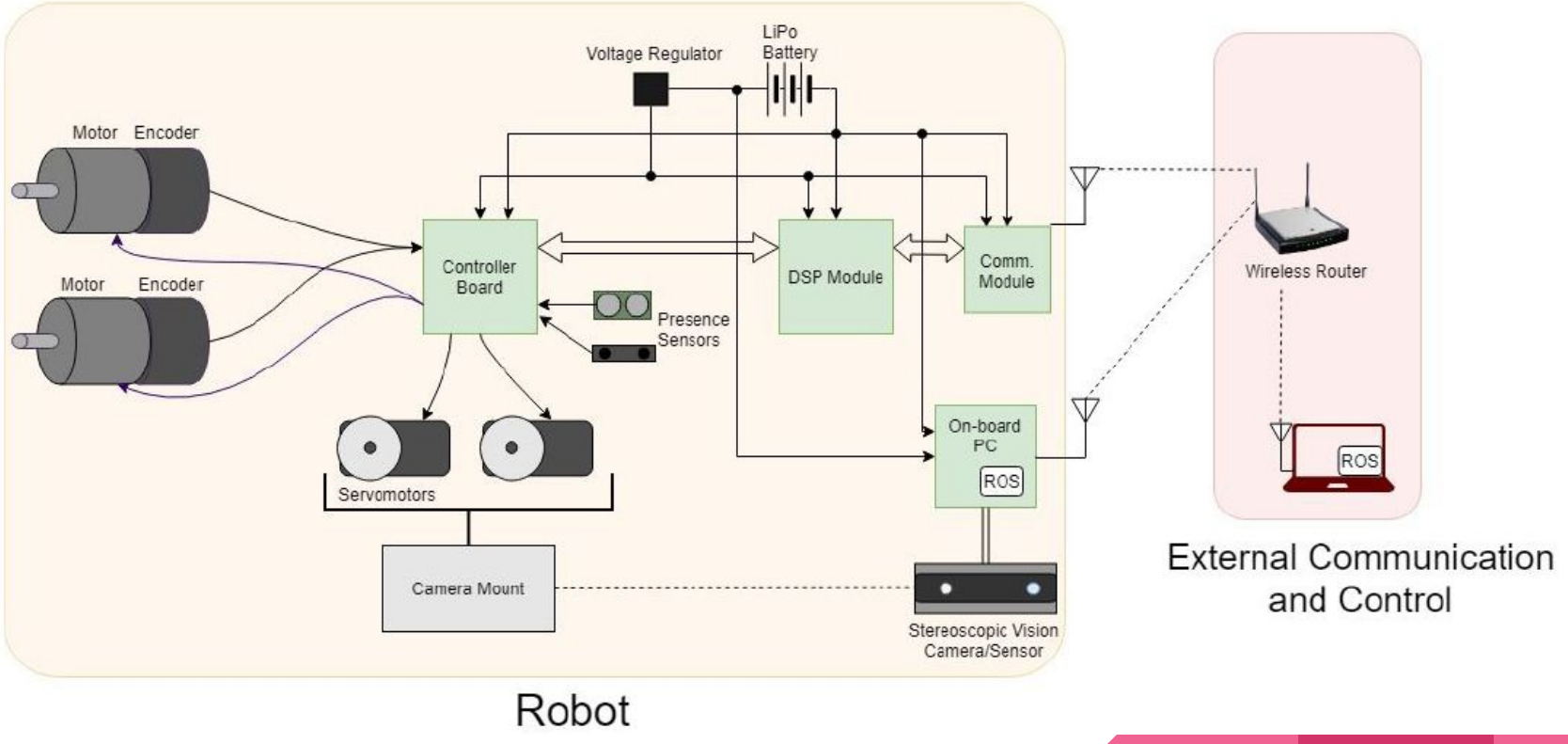
| Milestone | Assigned To | Start Date | Number of Days | Week | Sep 9-13 | Sep 16-20 | Sep 23-27 | Sep30-Oct4 | Oct 7-11 | Oct 14-18 | Oct 21-25 | Oct29-Nov1 | Nov 4-8 | Nov 11-15 | Nov 18-22 | Nov 25-29 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SSR | | | | CDR | | | Semana | | SIR | | Demo |
| | | | | | (Sep 9) | | | | (Oct 7) | | | i | | (Nov 11) | | (Nov 25) |
| Robot Connection and Startup | Everyone | 10-Sep-2019 | 4 | | | | | | | | | | | | | |
| Wireless Control Test | Emmanuel | 17-Sep-2019 | 3 | | | | | | | | | | | | | |
| On-board PC Supply Design | Uriel | 17-Sep-2019 | 1 | | | | | | | | | | | | | |
| On-board PC Supply Implementation | Uriel | 18-Sep-2019 | 2 | | | | | | | | | | | | | |
| On-board PC Configuration | Everyone | 23-Sep-2019 | 5 | | | | | | | | | | | | | |
| Use of PC as a ROS node | Marcos | 30-Sep-2019 | 3 | | | | | | | | | | | | | |
| ROS Remote Interfacing to the Robot | Emmanuel | 30-Sep-2019 | 3 | | | | | | | | | | | | | |
| Camera Mount Design | Marcos | 16-Sep-2019 | 3 | | | | | | | | | | | | | |
| Camera Mount Manufacturing | Marcos | 19-Sep-2019 | 1 | | | | | | | | | | | | | |
| Integration of Camera into Robot | Marcos | 20-Sep-2019 | 1 | | | | | | | | | | | | | |
| Remote Access to Camera through ROS | Uriel | 3-Oct-2019 | 2 | | | | | | | | | | | | | |
| Coordinate Frames Tracking and Transform Publication | Everyone | 7-Oct-2019 | 10 | | | | | | | | | | | | | |
| Map Building and Visualization with Manual Control | Everyone | 21-Oct-2019 | 10 | | | | | | | | | | | | | |
| Full Simultaneous Localization and Mapping (SLAM) Implementation | Everyone | 11-Nov-2019 | 10 | | | | | | | | | | | | | |

# Budget

| Element | Cost | Importance |
|---|---|---|
| X80 Robot [2] | 52762.86 MXN | High |
| Stereoscopic camera | 3600.00 MXN | High |
| On-board computer | 7000.00 MXN | High |
| 3D impression for camera base | 200.00 MXN | Medium |
| 14.1V LiPo battery | 700.00 MXN | High |
| Power converter | 300.00 MXN | Medium |

The total estimated cost of the project is 63,862 MXN.

# Internal and external interfaces



# Risk assessment

| Probability | Negligible | Minor | Moderate | Significant | Severe |
|---|---|---|---|---|---|
| Very High | Low Risk (I) | Medium Risk (II) | High Risk (III) | High Risk (III) | High Risk (III) |
| High | Low Risk (I) | Medium Risk (II) | Medium Risk (II) | High Risk (III) | High Risk (III) |
| Medium | Low Risk (I) | Low Risk (I) | Medium Risk (II) | High Risk (III) | High Risk (III) |
| Low | Low Risk (I) | Low Risk (I) | Medium Risk (II) | Medium Risk (II) | High Risk (III) |
| Very Low | Low Risk (I) | Low Risk (I) | Low Risk (I) | Low Risk (I) | High Risk (III) |
| | Impact | | | | |

Image retrieved from: [3]

# References

[1] Riisgaard, S. & Rufus, M. (2005). A Tutorial Approach to Simultaneous Localization and Mapping . September 3rd 2019, Massachusetts Institute of Technology. Retrieved from: https://dspace.mit.edu/bitstream/handle/1721.1/119149/16-412j-spring-2005/contents/projects/1aslam_blas_repo.pdf

[2] Dr Robot, Inc. (2019). X80: WiFi Mobile Robot Development Platform with extreme mobility and Video/Audio Capability . Retrieved from: http://www.drrobot.com/products_item.asp?itemNumber=x80

[3] PMI. (2008). A guide to the project management body of knowledge (PMBOK guide) . Newton Square, Pa: Project Management Institute, p. 292.