Sustainable Communication Networks
Prof. Dr. Anna Förster

Zentrum für angewandte Raumfahrttechnologie und Mikrogravitation (ZARM)
Dr.-Ing. Christiane Heinicke

Wireless Communication Technologies for the Moon and Mars Base Analog (MaMBA)

Prerequisites:	- Good knowledge of short and long range wireless communication technologies, e.g. LoRa, Zigbee, Bluetooth, WiFi. - Good understanding of wireless signal propagation - Experience with Python and/or C programming - Experience with embedded programming, e.g. Arduino or RPi - Willingness to learn new topics and to experiment with real hardware
Level:	This topic is appropriate for Master Students
Language:	German or English

INTRODUCTION

Recent projections see ESA's Moon Village inhabited before 2030. In order to provide shelter to the astronauts, the ZARM is developing the concept of a habitat prototype: The Moon and Mars Base Analog (MaMBA) combines the engineering requirements of supporting human life in the lunar environment and architectural needs to create a liveable, rather than "just" survivable home for astronauts. Last year, ZARM built a mock-up of the first module and evaluated its usability during two test runs.

Such a habitat inherently needs a high number of environmental sensors and controls to make it liveable and safe for the astronauts. This project targets to identify and evaluate the requirements of these sensors and actuators for MaMBA, identify and compare available wireless communication technologies and later on to build a prototype with several sensors and actuators connected.

Depending on the background of the student and on his/her portfolio, this project can be a master project and master thesis, or a master thesis only.

PROJECT DESCRIPTION

The objective of this work is to identify and evaluate first the requirements of the available and planned systems in MaMBA by talking to the MaMBA experts and scientists. The requirements analysis should identify at least the following points:

- Data traffic properties and volume
- Sensors and actuators to be connected
- Reliability and dependability requirements
- Scalability for the future
- Interference with other devices (not only other wireless communication technologies, but also other instruments and scientific experiments)
- Power consumption requirements and power availability
- Integration with other on-board systems, e.g. long-range communication, mission control, etc.

After the requirements analysis, a list of wireless communication technologies has to be prepared and evaluated first in theory with respect to the requirements. At least the following communication technologies should be included: WiFi, Bluetooth 5, Zigbee, EnOcean, WISP (advanced RFID), LoRa. Additionally, network protocols need to be considered on top of the various technologies.

Contact

If you are interested in this work, please contact us via mail: projects@comnets.uni-bremen.de

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