

Development of a Mars Curiosity Rover Simulator

A working model intended for modern space science education
and outreach



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Terms of Reference

Title

Development of a Mars Curiosity Rover Simulator for the Cape Town Science Centre

Description

Our knowledge of the planet Mars has been greatly expanded by several rovers that have landed on the planet over the past twenty years. The most capable of these is the Mars Science Laboratory/Curiosity Rover, which is currently exploring the surface of Mars. The Cape Town Science Centre has requested the UCT SpaceLab to design and build a model of a Mars exploration rover that will be the centrepiece of a future Mars exhibit at the Centre.

Deliverables

Skills and Requirements

Mechanical Design, Software and Electronics Interfacing and Programming.

Area

Science and Technology

Declaration

1. I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.
2. I have used the IEEE convention for citation and referencing. Each contribution to, and quotation in, this report from the work(s) of other people has been attributed, and has been cited and referenced.
3. This report is my own work.
4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as their own work or part thereof.

Signature:.....
Sean Wood

Date:.....

Acknowledgments

Abstract

- Open the **Project Report Template.tex** file and carefully follow the comments (starting with %).
- Process the file with **pdflatex**, using other processors may need you to change some features such as graphics types.
- Note the files included in the **Project Report Template.tex** (with the .tex extension excluded). You can open these files separately and modify their contents or create new ones.
- Contact the latex manual for more features in your document such as equations, subfigures, footnotes, subscripts & superscripts, special characters etc.
- I recommend using the **kile** latex IDE or *TeXstudio*, as they are simple to use.

Contents

Terms of Reference	i
Declaration	ii
Acknowledgements	iii
Abstract	iv
Glossary	viii
1 Introduction	1
1.1 Background to the study	1
1.2 Objectives of this study	1
1.2.1 Problems to be investigated	1
1.2.2 Purpose of the study	1
1.3 Scope and Limitations	1
1.4 Plan of development	2
1.5 Report Outline	2
2 Literature Review	3
2.1 Space Exploration and NASA’s Journey to Mars	3
2.2 The Mars Science Laboratory	4
2.3 Space Education and Outreach	4
2.4 Web Application Technologies Within the Context of Embedded Systems	4
2.5 Additive Prototyping and Manufacturing Techniques	4
3 Discussion	5
4 Conclusions	6
5 Recommendations	7
A Additional Files and Schematics	9
B Addenda	10
B.1 Ethics Forms	10

List of Figures

List of Tables

Glossary

Abbreviations listed here are used throughout the document.

- MSL - Mars Science Laboratory

Chapter 1

Introduction

1.1 Background to the study

A very brief background to your area of research. Start off with a general introduction to the area and then narrow it down to your focus area. Used to set the scene [?]. The section should highlight challenges in the study area to put your work in context [1].

1.2 Objectives of this study

1.2.1 Problems to be investigated

Description of the main problem(s) to be solved and/or hypothesis of your work. Questions to be answered in order to confirm the hypothesis or solve the problems are also articulated here.

1.2.2 Purpose of the study

Give the significance of investigating these problems. It must be obvious why you are doing this study and why it is relevant. Contributions of your work should also be given here.

1.3 Scope and Limitations

Scope indicates to the reader what has been and not been included in the study. Limitations tell the reader what factors influenced the study such as sample size, time etc. It is not a section for excuses as to why your project may or may not have worked.

1.4 Plan of development

This section summarizes the methods, tools, techniques and the order of doing things followed in order to accomplish your work. It also includes such planning tools as project Gantt chart, Critical path analysis and mind mapping.

1.5 Report Outline

Here you tell the reader how your report has been organised and what is included in each chapter. You should give a synopsis for each of your chapters here.

I recommend that you write this section last. You can then tailor it to your report.

Chapter 2

Literature Review

2.1 Space Exploration and NASA's Journey to Mars

The human race possesses a trait that proposedly sets us apart from life around us; the powerful will to explore what is unknown. It is the curiosity and the thrill to push past the boundaries of what is thought to be possible, perhaps felt stronger by some, that forms the basis of many scientific endeavours relating to facts of life and existence around and outside of the immediate environment in which we live.

A prime example of such a drive to explore is in the research and exploration of outer space, which, from a technological perspective, transitioned from astronomer's dream to scientist's and engineer's reality during the Cold War. Although space exploration as we know it today is motivated by human curiosity, it was during this period of political tension that significant breakthroughs in spacecraft and rocket propulsion technology were brought about. This period is referred to as the "Space Race" and stemmed from research and development of nuclear weaponry during World War II [2, p. 147]. The race began with the attempted launches of artificially made satellites [3, pp. 3-5] and within the 40 years following the success of the USSR's *Sputnik I* in 1957, the first object to be put into orbit by man, space technology progressed from early manned flights beginning in 1961¹ through the *Apollo 11* lunar flight to the flying by of the majority of the planets in our solar system.

By 1981, the launch of Columbia [4], a space shuttle designed to be used for more than one flight, marked the beginning of reusable space technologies answering to the problem of cost and with the forethought of future increase in space flight frequency.

¹First human in space, Soviet launched

- 2.2 The Mars Science Laboratory**
- 2.3 Space Education and Outreach**
- 2.4 Web Application Technologies Within the Context of Embedded Systems**
- 2.5 Additive Prototyping and Manufacturing Techniques**

Chapter 3

Discussion

Here is what the results mean and how they tie to existing literature...

Discuss the relevance of your results and how they fit into the theoretical work you described in your literature review.

Chapter 4

Conclusions

These are the conclusions from the investigation and how the investigation changes things in this field or contributes to current knowledge...

Draw suitable and intelligent conclusions from your results and subsequent discussion.

Chapter 5

Recommendations

Make sensible recommendations for further work.

Bibliography

- [1] E. Kamen and B. Heck, *Fundamentals of Signals and Systems Using the Web and MATLAB*. Prentice Hall, 2000.
- [2] J. Cornwell, *Hitler's scientists : science, war, and the devil's pact*. New York: Viking, 2003.
- [3] J. Schefter, *The race : the uncensored story of how America beat Russia to the moon*. New York: Doubleday, 1999.
- [4] W. Harwood, "Sts-129/iss-ulf3 quick-look data,"
<http://www.cbsnews.com/network/news/space/129/129quicklook2.pdf>, Oct 2009.

Appendix A

Additional Files and Schematics

Add any information here that you would like to have in your project but is not necessary in the main text. Remember to refer to it in the main text. Separate your appendices based on what they are for example. Equation derivations in Appendix A and code in Appendix B etc.

Appendix B

Addenda

B.1 Ethics Forms