

**UNIVERSITY OF NAIROBI**

**FINAL YEAR PROJECT**

**TITLE:** SOFTWARE DEFINED RADIO GPS RECEIVER

**PROJECT NO.123**

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Date 11th May 2012

***Department of Electrical and Information Engineering***

**DEDICATION**

To my ancestors.

i

**Acknowledgement**

This acknowledgement is intended to thank all those involved in my project directly and indirectly. I would like to express my sincere gratitude to Prof V.K Oduol for his valuable guidance during project developing period. I appreciate whoever gave birth to the internet idea for enabling a medium where research of such projects has been greatly enhanced. Lastly my deep appreciation goes to my family for encouragement and never-ending support throughout the project period.

ii

**Abstract**

Global Positioning System (GPS), a process used to establish a position at any point on planet Earth sphere; latitude, Longitude co-ordinates, altitude and time. Software defined radio (SDR) receiver, is one of the techniques to implement GPS receiver. SDR is preferred to conventional receivers because of the easy analyzing of GPS signal and high processing speed of the personal computer processor currently quad core.

The aim of the project was to study GPS and design SDR, design and demonstrate SDR, in this project i used Matlab/Simulink for both simulate the SDR and implement. The RF Front end design was completed; though the components were not available the design offered the mathematical modeling of the equations, which were very necessary in especially determining the sampling frequency of the ADC. All the integrated circuits in the RF Front end were chosen from the Analogue Devices Company. The bandpass filters in the RF Front were design and simulated by RFsim99 software a tool for designing high frequency application, that only needs the center frequency and bandwidth specification to generate a filter circuit diagram together with graphical plot. The ADC of my choice had 8 output, that could not be connected to the serial port required by the Matlab directly, i incorporated parallel to serial port converter to make it possible.

To simulate the receiver, a had to first of all model the GPS satellite model to generate the GPS L1 civilian signal. Since I was not interest in the down-conversion of the transmitted signal from the GPS model, i transmitted the same frequency that is digitized that is 7MHz as my carrier frequency instead of 1.57542 GHz for real-time case. In acquisition stage of my model i used FFT search because of the speed operation offered by the method, the method gave expected results. In tracking stage of my system i used Costas loop that offers only tracking of the carrier, it has feedback loop in form of phase locked loop by this topology fine acquisition was achieved.

The GPS software define radio receiver is supposed to display the longitude, latitude altitude and time on the screen, this can only be done with minimum of four different satellite signal; to make position calculation possible. Since in simulation you can only model the format of the navigation data signal and not different data of different satellite the receiver was demonstrated up to the tracking stage of the receiver. iii