GLOBAL POSITIONING SYSTEM (GPS) BY KALMAN FILTERING

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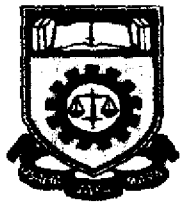

HARIS BIN SEPIKUN
Faculty of Electrical Engineering
Institut Teknologi MARA
40450 Shah Alam, Malaysia
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ABSTRACT

Global Positioning System By Kalman Filtering

This thesis considers the implementation of a Kalman Filter in a Global Positioning System (GPS) to improve its navigation performance. The GPS calculates the position (latitude and longitude) of any point on earth. The observable known as pseudorange is a timing measurement of the propagation delay that is due to the geometric range from the transmitting satellite signal to the receiver clock offset from satellite time.

Kalman Filter is used to improve the navigation system which gives an accurate target tracking signal. This technique is used to process the pseudoranges and estimate the position and velocity of the target tracking. Since the signals are non-linear, the tracker model used is the Extended Kalman Filter (EKF). The EKF approximates the optimum estimate by expanding non-linear system function into the Taylor-series about its normal operating values and, neglecting the high order term i.e. by linearizing the nonlinear system.

1.0 INTRODUCTION

1.1 Navigation

Navigation is defined as the science of planning and keeping a moving vehicle on a path from one place to another [11]. Science is crucial in developing this field such as improving the instrument, method and etc. Scientific research towards this field may ease navigation and may also produce higher accuracy. Navigation is mainly used by ships which could not rely on any landmark to determine their location. However, it is also needed by by aircrafts and land vehicles.

1.2 Coordinate System

As shown in figure 1.1, if the IERS (International Earth Rotation Service) spin axis is regarded as the Z-axis, the X-axis is in the direction of the zero meridian or IERS Reference Meridian (IRM). and the Y axis is pependicular to both, a conventional three-dimensional coordinate system is formed [6]. Cartesian coordinate are used in satellite position fixing. Where the various systems have parallel but different origins, translation from one to the other will be related by simple translation parameters in X, Y and Z.

Whilst the cartesian coordinate system provides a simple, well defined method of defining position, it is not always convenient interms of heights. As the Z ordinate vertical from the horizontal equatorial and ellipsoidal height (h) are in a direction normal to the surface of the reference ellipsoid, an increase in h will not produce an equal increase in Z

In this studies, the determination of receivers coordinate are on the Geoncentric System which considered the earth is a perfect spfere. The position of latitude and