

Forecasting Ionospheric Delay at UKM using Statistical Method

Mardina ABDULLAH^{1#}, Alina Marie HASBI¹, Siti Aminah BAHARI¹, Muhammad Norshafiq ABD KADIR¹

¹Universiti Kebangsaan Malaysia, Malaysia

[#]Corresponding author: mardina@eng.ukm.my ⁺Presenter

GPS signals propagate through the ionosphere before reaching the receiver on Earth. The ionosphere delays GPS signals by changing the speed and direction of the signal propagation, which impacts the accuracy of GPS significantly. The ionospheric delay could reach 100 m during geomagnetic storm. Thus, a study of ionospheric delay prediction is important to reduce GPS positioning error. This paper presents the results of ionospheric delay prediction using GPS measurements obtained from the GPS Ionospheric TEC and Scintillation Monitor (GISTM) UKM station from February to December 2010. In order to predict the ionospheric delay, Holt-Winter statistical method was chosen due to its suitability to predict the time series with repeated seasonal patterns. The predicted ionospheric delay exhibits an increasing trend during morning hours (08:00-12:00 LT) from 1.7 to 3.8 m and a decreasing trend in the afternoon to nighttime hours (15:00-21:00 LT) from 3.5 to 1.3 m. The observed predicted ionospheric delay shows the same pattern as the actual delay value. The maximum percentage of error between the predicted and actual ionospheric delay in the morning and afternoon to nighttime hours was found to be during summer and equinox months, respectively. These results show that the ionospheric delay predicted by using the Holt-Winter method has both diurnal and seasonal variations.

Keywords: Holt-Winter, GPS, ionospheric delay