Optimization of GPS Sensor on Smart Cane for Improving Location Accuracy Using Moving Average Filter Displayed via Telegram

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ABSTRACT

The smart cane is a form of assistive technology innovation designed to support the mobility of visually impaired individuals. This study focuses on optimizing the GPS *sensor on a smart cane to improve location tracking accuracy. The system is built using two* GPS *Neo-6M modules connected to an* ESP 32 *microcontroller. The coordinate data from both sensors is converted from DMS (Degrees, Minutes, Seconds) format to decimal format and then processed using the Moving Average Filter (MAF) method. The filtered coordinate results are automatically sent to the* Telegram *application via a GSM Sim800L module, allowing guardians or supervisors to monitor the user's real-time location.*

The system was tested at two outdoor locations under normal weather conditions. The evaluation results show that the Moving Average coordinates have a very small average difference compared to satellite GPS *reference data, with a Pearson correlation value reaching 0.99995. This proves that the application of MAF is effective in enhancing the stability and accuracy of* GPS *data. Thus, the system not only improves the reliability of location tracking but also serves as a practical solution to support the safety and mobility of visually impaired users.*

***Keywords:** Smart Cane,* GPS *Neo-6M, Moving Average Filter,* ESP 32, Telegram