ABSTRAK

PENGEMBANGAN TONGKAT PINTAR BERBASIS IOT UNTUK TUNANETRA DENGAN DETEKSI OBJEK DAN GPS

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Penyandang tunanetra sering mengalami kesulitan dalam mendeteksi rintangan dan menentukan arah saat beraktivitas di luar ruangan. Penelitian ini bertujuan mengembangkan tongkat pintar berbasis *Internet of Things* (IoT) yang dapat mendeteksi rintangan dan genangan air serta mengirimkan lokasi secara *real-time* melalui GPS yang diteruskan ke MQTT broker. Metode pengembangan yang digunakan adalah *Rapid Application Development* (RAD) dengan empat tahapan: *requirement planning*, *user design*, *construction*, dan *cutover*. Sistem menggunakan mikrokontroler ESP32, sensor ultrasonik, *water level sensor*, GPS Neo-6M, modul INA219, modul *boost converter* (*step up*), serta modul komunikasi SIM800L dan *Wifi*. Pengujian Black Box Testing menunjukkan tongkat mampu mendeteksi rintangan hingga ±125 cm dan genangan air >0,3 cm dengan peringatan suara dari *buzzer*. GPS memiliki akurasi 4–7 meter, dan tombol darurat berhasil mengirimkan notifikasi darurat secara *real-time*. Fitur *callback* juga memungkinkan komunikasi dua arah untuk respons fitur notifikasi darurat. Uji coba lapangan menunjukkan alat ini efektif meningkatkan keamanan dan kenyamanan mobilitas tunanetra.

Kata Kunci: *IoT*, Rapid Application Development (RAD), tunanetra, GPS, MQTT.

ABSTRACT

DEVELOPMENT OF IOT-BASED SMART STICKS FOR THE BLIND WITH OBJECT DETECTION AND GPS

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Visually impaired individuals often face difficulties in detecting obstacles and determining directions when performing outdoor activities. This study aims to develop an Internet of Things (IoT)-based smart cane capable of detecting obstacles and water puddles, as well as transmitting real-time location data through GPS, which is then sent to an MQTT broker. The development method used is Rapid Application Development (RAD) with four stages: requirement planning, user design, construction, and cutover. The system utilizes an ESP32 microcontroller, ultrasonic sensor, water level sensor, GPS Neo-6M, INA219 module, boost converter (step-up), and SIM800L and WiFi communication modules. Black Box Testing shows that the smart cane can detect obstacles up to ±125 cm and water puddles deeper than 0.3 cm, providing audio alerts through a buzzer. The GPS achieves an accuracy of 4–7 meters, and the emergency button successfully sends real-time emergency notifications. The callback feature enables two-way communication to respond to emergency notifications. Field tests indicate that the device effectively enhances the safety and mobility of visually impaired individuals.

Keywords: IoT, Rapid Application Development (RAD), visually impaired, GPS, MQTT.