RANCANG BANGUN ALAT PENUNJUK ARAH KIBLAT SHOLAT BAGI PENYNDANG TUNANETRA BERBASIS ESP32 DENGAN SENSOR KOMPAS HMC5883L DAN SENSOR ULTRASONIK

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ABSTRAK

Arah kiblat merupakan syarat sah sholat yang harus menghadap Ka'bah di Masjidil Haram. Bagi penyandang tunanetra, menentukan arah kiblat secara mandiri menjadi tantangan tersendiri karena keterbatasan penglihatan. Penelitian ini merancang alat penentu arah kiblat berbasis mikrokontroler ESP32 yang dilengkapi sensor kompas HMC5883L untuk mengukur azimut kiblat dan sensor ultrasonik HC-SR04 untuk mendeteksi penghalang di depan pengguna. Sistem dilengkapi modul DFPlayer Mini sebagai media keluaran suara yang memberikan instruksi seperti "putar ke kiri", "putar ke kanan", atau "kiblat sesuai". Pengujian dilakukan di sepuluh lokasi berbeda dan menunjukkan rata-rata selisih pembacaan di bawah 2° dibanding metode manual, sedangkan sensor ultrasonik mampu memberikan peringatan ketika terdapat objek pada jarak kurang dari 50 cm. Hasil ini menunjukkan bahwa prototipe dapat bekerja dengan baik, memberikan informasi arah kiblat secara cepat dan akurat, serta membantu penyandang tunanetra beribadah secara mandiri.

Kata Kunci : Arah Kiblat, Penyandang Tunanetra, ESP32, HMC5883L, HC-SR04, DFPlayer Mini

DESIGN AND CONSTRUCTION OF A QIBLAT DIRECTION INDICATOR FOR PRAYER FOR THE BLIND BASED ON ESP32 WITH HMC5883L COMPASS SENSOR AND ULTRASONIC SENSOR

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ABSTRACT

The Qibla direction is a requirement for the validity of prayer, which must face the Kaaba in the Masjid al-Haram. For individuals with visual impairments, determining the Qibla direction independently poses a significant challenge due to their limited eyesight. This research designs a Qibla direction device based on the ESP32 microcontroller, equipped with an HMC5883L compass sensor to measure the Qibla azimuth and an HC-SR04 ultrasonic sensor to detect obstacles in front of the user. The system is complemented by a DFPlayer Mini module as an audio output medium, providing instructions such as "turn left," "turn right," or "Qibla aligned." Testing was conducted at ten different locations, showing an average reading difference of less than 2° compared to the manual method, while the ultrasonic sensor was able to issue warnings when an object was detected within a distance of less than 50 cm. These results indicate that the prototype can function effectively, providing Qibla direction information quickly and accurately, and helping visually impaired individuals perform prayers independently.

Keywords *: Qiblah Direction, Visually Impaired, ESP32, HMC5883L, HC-SR04, DFPlayer Mini*