

JUDUL: PERANCANGAN KONTROLER POINTING ANTENA YAGI PADA  
FREKUENSI RADIO BERBASIS MIKROKONTROLER DI UNIVERSITAS  
SURABAYA TENGILIS

Nama: Ronald Alexander Yosefhan.  
Jurusan: Teknik Elektro.  
Pembimbing: Susilo Wibowo, S.T., M.Eng.

**ABSTRAK**

Pada sistem komunikasi nirkabel yang menggunakan antena, arah antena pusat memegang peranan penting. Hal ini dikarenakan penyimpangan arah antena mempengaruhi kinerja komunikasi. Oleh karena itu, dibutuhkan sebuah proses *pointing* untuk mendapatkan arah antena yang lebih baik. Pada Tugas Akhir ini penulis merancang kontroler *pointing* antena untuk memudahkan proses *pointing* dan menguji ketepatan *pointing* dengan parameter yang dapat diukur. Perancangan tersebut diimplementasikan di gedung Fakultas Teknik Universitas Surabaya. Perancangan tersebut mampu melakukan *pointing* ke arah target *pointing* berdasarkan nilai masukkan koordinat geografis dan nilai tekanan udara yang dikonversi menjadi nilai azimut dan elevasi. Perancangan alat *pointing* ini terdiri dari empat komponen utama, yakni modul komunikasi, desain antena, motor *servo*, dan mikrokontroler. Fokus Tugas Akhir ini adalah merancang alat *pointing* berdasarkan keempat komponen utama serta menguji ketepatan alat *pointing* berdasarkan parameter gerak kontroler dan sinyal daya terima. Pengerjaan dibagi menjadi dua belas tahap: konsep desain alat *pointing* keseluruhan, perancangan modul komunikasi, perancangan motor *servo*, desain rangkaian mikrokontroler, konsep komunikasi modul komunikasi, konsep desain antena Yagi, penggabungan antena Yagi dengan alat *pointing*, kalibrasi motor *servo* setelah diberi beban alat *pointing*, desain *user interface*, perancangan *target pointing*, perhitungan waktu pemakaian maksimum baterai, dan desain akhir alat *pointing* dan target *pointing*. Pengujian meliputi uji antena, uji gerak kontroler, uji sinyal daya terima, uji *user interface*, dan uji *transceiver*. Hasil menunjukkan parameter antena yang didapatkan berupa SWR 1.33, kuat sinyal  $\pm 12$  dB, dan *beamwidth*  $\pm 62^\circ$ . Kontroler azimut memiliki *error rate* gerak  $1^\circ$ . Nilai sinyal daya terbaik didapatkan -88 dB pada *spreading factor* 7 dan *bandwidth* 500 kHz. Uji data *sensor* menggunakan modul *sensor* BMP280 pada Tugas Akhir ini memiliki *error rate* sebesar  $\pm 2$  °C.

Kata kunci: alat *pointing*, RSSI, gerak kontroler, antena Yagi, *servo*.

**TITLE: YAGI ANTENNA POINTING CONTROLLER DESIGN IN RADIO  
FREQUENCY BASED ON MICROCONTROLLER AT SURABAYA UNIVERSITY,  
TENGILIS**

Name: Ronald Alexander Yosefhan.  
Dicipline: Electrical Engineering.  
Advisor: Susilo Wibowo, S.T., M.Eng.

**ABSTRACT**

*Wireless communication systems that use antennas, the direction of the central antenna plays an important role. This is because antenna deviations affect the communication performance. Therefore, we need a pointing process to get a better antenna direction. In this Final Project, the author designed the antenna pointing controller to facilitate the pointing process and test the accuracy of pointing with parameters that can be measured. The design was implemented at Faculty of Engineering building, Surabaya University. The design is able to do pointing in the direction of target pointing based on geographic coordinate input values and air pressure values that are converted to azimuth and elevation values. The design of this pointing tool consists of four main components, namely the communication module, antenna design, servo motor, and microcontroller. The focus of this Final Project is to design a pointing tool based on the four main components and test the accuracy of the pointing tool based on the controller motion parameters and the received power signal. Workmanship is divided into twelve stages: overall pointing tool design concept, communication module design, servo motor design, microcontroller circuit design, communication module communication concept, Yagi antenna design concept, merging of Yagi antenna with pointing tool, servo motor calibration after pointing load, user interface design, target pointing design, calculation of maximum battery usage time, and final design of pointing and target pointing tools. The tests include antenna test, controller motion test, received signal test, user interface test, and transceiver test. The results showed that the antenna parameters obtained were SWR 1.33, signal strength  $\pm 12$  dB, and beamwidth  $\pm 62^\circ$ . The azimuth controller has a motion error rate of  $1^\circ$ . The best power signal values obtained -88 dB at spreading factor 7 and bandwidth of 500 kHz. Sensor data test using BMP280 sensor module in this Final Project has an error rate of  $\pm 2^\circ\text{C}$ .*

*Keywords: pointing device, RSSI, motion controller, Yagi antenna, servo*