ABSTRAK

RANCANG BANGUN TANGAN PROSTETIK DENGAN METODE QUALITY FUNCTION DEPLOYMENT DAN REVERSE ENGINEERING

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Kehilangan tangan akibat amputasi memberikan dampak signifikan terhadap kemampuan fungsional dan psikologis individu. Oleh karena itu, diperlukan pengembangan tangan prostetik yang mampu mendukung aktivitas sehari-hari secara efektif dan mudah digunakan. Penelitian ini bertujuan merancang dan membangun prototipe tangan prostetik bagi pasien amputasi transradial dengan menerapkan metode *Quality Function Deployment* (QFD) untuk menentukan kebutuhan pengguna serta *Reverse Engineering* untuk mengoptimalkan desain secara ergonomis dan fungsional. Perancangan dilakukan dengan mengidentifikasi *Voice of Customer* dan menerjemahkannya ke dalam respon teknis melalui penyusunan *House of Quality*. Konsep desain kemudian dibuat dalam bentuk pemodelan 3D dan direalisasikan melalui proses 3D printing. Dalam penelitan ini, perintah tangan prostetik menggunakan perintah suara berbasis Raspberry Pi Zero 2 W, sedangkan sensor *Force Sensitive Resistor* (FSR) digunakan sebagai umpan balik untuk mengatur kekuatan genggaman secara otomatis. Selain itu, modifikasi pada ruas jari dan mekanisme ibu jari berhasil meningkatkan fleksibilitas gerak dan efektivitas genggaman. Kombinasi metode QFD dengan *Reverse Engineering* berhasil menghasilkan desain dan *prototype* tangan yang fungsional sehingga dapat meningkatkan kemudahan penggunaan serta memberikan dukungan bagi aktivitas sehari-hari pengguna.

Kata Kunci: Tangan prostetik, QFD, Reverse Engineering, 3D printing, Sensor FSR, Perintah Suara.

ABSTRACT

PROSTHETIC HAND DESIGN AND CONSTRUCTION USING QUALITY FUNCTION DEPLOYMENT AND REVERSE ENGINEERING METHODS

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The loss of a hand due to amputation has significant impacts on an individual's functional abilities and psychological well-being. Therefore, the development of a prosthetic hand that can effectively support daily activities and is easy to use is essential. This study aims to design and develop a prosthetic hand prototype for transradial amputees by applying the Quality Function Deployment (QFD) method to determine user needs, as well as Reverse Engineering to optimize the design ergonomically and functionally. The design process begins by identifying the Voice of Customer and translating it into technical responses through the construction of a House of Quality. The design concept is then developed in the form of a 3D model and realized through 3D printing. In this study, the prosthetic hand is controlled using voice commands based on a Raspberry Pi Zero 2 W, while a Force Sensitive Resistor (FSR) sensor is utilized as feedback to automatically regulate gripping force. Additionally, modifications to the finger segments and thumb mechanism successfully improved movement flexibility and gripping effectiveness. The combination of QFD and Reverse Engineering methods resulted in a functional hand design and prototype that enhances usability and provides support for the user's daily activities.

Keywords: *Prosthetic Hand, QFD, Reverse Engineering, 3D Printing, FSR Sensor, Voice Control*

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