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# Certificate of Appreciation

Dr. Ir. R. Rizal Isnanto, S.T., M.M., M.T., IPM.

as The Presenter

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# Assessment on Image Quality Changes as a Result of Implementing Median Filtering, Wiener Filtering, Histogram Equalization, and Hybrid Methods on Noisy Images



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#### Abstract



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## Thursday, 24 September 2020

#	SESSION	SPEAKER(S)	TIME	VENUE
1	REGISTRATION		07.30 AM - 08:00 AM	BALLROON
2	OPENING CEREMONY		08:00 AM - 08:45 AM	BALLROON
3	COFFEE BREAK		08.45 AM - 09:00 AM	BALLROON
4	PLENARY SESSION : 1	(PROF. DR. ZAINAL SALAM) (HTTPS://ICITACEE.UNDIP.AC.ID/2020/SPEAKER/ZAINALSALAM/)	09.00 AM - 10:00 AM	BALLROON

CITACEISSION		SPEAKER(S)	TIME	VENUE
(https://icit 5	tacee.undip.ac.id/2020) PLENARY SESSION : 2	ASSOC. PROF. DR. S. ALBERT ALEXANDER (HTTPS://ICITACEE.UNDIP.AC.ID/2020/SPEAKER/ABDULWAHAB/)		
6	PLENARY SESSION : 3	ASSOC. PROF. DR. R. RIZAL ISNANTO (HTTPS://ICITACEE.UNDIP.AC.ID/2020/SPEAKER/RIZAL- (ISNANTO/)	11.00 PM – 12:00 AM	BALLROON
7	LUNCH BREAK		12:00 AM - 13:00 PM	BALLROOM
8	PARALLEL SESSION		13.00 PM – 17.00 PM	

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## Program

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Presenter bio: Iam Lecturer at electrical engineering department unmer - malang pp. 1-6

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<u>R Rizal Isnanto,</u> Yudi Windarto and Mutiara Victorina Mangkuratmaja

Presenter bio: Associate Professor Dr. R. Rizal Isnanto Lecturer in Computer Engineering Department, Diponegoro University, Semarang, Indonesia.

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Presenter bio: An assistant professor in Department of Mechanical Engineering, Diponegoro University, Indonesia. A researcher in Center for Biomechanics, Biomaterial, Biomechatronics and Biosignal Processing (CBIOM3S) Diponegoro University. I conduct a research on biomechanics, biomaterial, biomechatronics, tribology and engineering design. pp. 288-293

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# Assessment on Image Quality Changes as a Result of Implementing Median Filtering, Wiener Filtering, Histogram Equalization, and Hybrid Methods on Noisy Images

R. Rizal Isnanto Department of Computer Engineering Diponegoro University Semarang, Indonesia email: rizal@ce.undip.ac.id Yudi Eko Windarto Department of Computer Engineering Diponegoro University Semarang, Indonesia email: email: yudi@live.undip.ac.id Mutiara Victorina Mangkuratmaja Department of Computer Engineering Diponegoro University Semarang, Indonesia mutiaravm@student.ce.undip.ac.id

Abstract— The information content in an image can experience a decrease in quality due to noises. Accordingly, noise removal and histogram equalization (HE) are among the processes used to enhance image quality. The purpose of this research is to determine the effect of changes in image quality as a result of applying median filtering (MF), Wiener filtering (WF), HE, or hybrid methods on noisy images. Here, face images are used as input. The research stages began with preprocessing, i.e., cropping, size normalization, and color-togray conversion. Then, Gaussian and salt-and-pepper noises with intensities of 20%, 50%, and 80% are applied to the images. Consequently, the processes, i.e., HE, MF, WF, hybrid method 1 (HE and MF), and hybrid method 2 (HE and WF), are implemented, and then the image quality is evaluated. The results of the research show that the best methods to enhance Gaussian and salt-and-pepper noisy images are WF and MF, respectively. HE and the two hybrid methods generally do not improve image quality. The implementation of hybrid method 2 results in the maximum structural similarity index with 80% Gaussian noise. Meanwhile, MF provides the minimum meansquare error and maximum peak signal-to-noise ratio with 20% Gaussian noise.

Keywords — histogram equalization, median filtering, Wiener filtering, Gaussian noise, salt-and-pepper noise

#### I. INTRODUCTION

Image data acquisition sometimes results in poor quality images. The information content in an image can experience a decrease in quality due to noises. Accordingly, noise removal and histogram equalization (HE) are among the examples of processes to enhance image quality. Image enhancement methods are required to improve the quality of images and maximize the information content that exists in the input image so that it can obtain a form of visualization that is better and more easily interpreted by humans and computer machines. The most commonly used image enhancement methods are HE, Wiener filtering (WF), and median filtering (MF)[1].

The purpose of this research is to determine the effect of changes in image quality as a result of applying MF, WF, HE, and hybrid methods on noisy images. The hybrid methods proposed in this research are hybrid method 1 (HE + MF) and hybrid method 2 (HE + WF).

#### **II. PREVIOUS WORKS**

Erwin *et al.* examined three image enhancement methods, i.e., image sharpening, contrast enhancement, and standard MF. The image quality parameters used in this study are based on mean-square error (MSE), peak signal-to-noise ratio (PSNR), and structural similarity index (SSIM) values. The results of this study indicate that the highest PSNR, MSE, and SSIM values were obtained in the implementation of the MF method with PSNR = 37.83, MSE = 145.81, and SSIM = 0.97 [2]. George *et al.* concluded that median-based filters are commonly used to remove impulse noises. Some types of MF include recursive MF, iterative MF, directional MF, weighted MF, adaptive MF, progressive switching median (PSM) filter, and threshold MF [3].

Kunsoth and Binwas proposed a modified decision-based MF for impulse noise removal. Their experimental results show that the proposed method performs better than the standard MF, weighted MF, adaptive MF, and decision-based MF, especially when a high noise intensity level [4]. Priestley *et al.* proposed a decision-based switching MF for image restoration. The performance of this algorithm was tested against four noise models with different levels of noise densities and was evaluated in terms of performance metrics, including PSNR and IEF. It provided better results for images that were extremely corrupted with up to 90% noise density and outperformed classic filters in terms of handling image corruption [5].

Darus *et al.* proposed a modified hybrid MF for the removal of low-density random-valued impulse noise in images. This technique has been proven to be capable of overcoming the shortcomings of a standard MF and improve the hybrid MF in restoring image details and operating at high noise densities [6]. Khatri and Kasturiwale conducted a computer analysis to analyze the performance of the proposed method with that of simple MF, simple adaptive MF, and adaptive switched MF. The proposed filter was proven to be more efficient in terms of objective and subjective parameters [7]. Goyal and Chaurasia explained that random-valued impulse noise is the most frequent cause of distortion in natural images [8].

Lahmiri and Boukadoum proposed a combination of WF and partial differential equation (PDE) filtering to form a sequential hybrid filter. Their experimental results showed the superiority of the proposed system over using either the

# Trajectory Planning with Obstacle Avoidance of 3 DoF Robotic Arm for Test Tube Handling System

Hadha Afrisal <sup>1,2</sup> <sup>1</sup>Department of Electrical Engineering <sup>2</sup>CBIOM3S Universitas Diponegoro Semarang, Indonesia hadha.afrisal@elektro.undip.ac.id

Rose Mutiara Suin Department of Electrical Engineering Faculty of Engineering Universitas Diponegoro Semarang, Indonesia rosemutiara2506@gmail.com Budi Setiyono Department of Electrical Engineering Faculty of Engineering Universitas Diponegoro Semarang, Indonesia budi@lecturer.undip.ac.id

Olimjon Toirov Department of Electrical Machines *Tashkent State Technical University* Tashkent, Uzbekistan toirov.olimjon@tdtu.uz Muhammad Fahmi Yusuf Department of Electrical Engineering Faculty of Engineering Universitas Diponegoro Semarang, Indonesia fahmiyusuf82@gmail.com

Abstract—This paper presents a trajectory planning method with obstacle avoidance strategy of 3 DoF parallel link robotic arm to perform the task of autonomous test tube handling. For implementation in real-world environment such as in the process of material handling within healthcare setting, robotic arm frequently needs to deal with obstacles come up on its way of finishing its task. Hence to maintain a smooth actuation and a safer manipulation point-to-point from a start to a goal position, a method of trajectory planning with obstacle avoidance is required. In this paper, the method of cubic polynomials trajectory generation with distance calculation for obstacle avoidance has been performed. The result of our experiments shows that our proposed method is successfully demonstrated with a high degree of accuracy and precision in our research setup. The average position error of trajectory tracking is not more than 0.43 cm during the experiment with obstacle, and 0.35 cm during the experiment without obstacle.

#### Keywords—Robotic arm, parallel link, inverse kinematics, trajectory planning, obstacle avoidance

#### I. INTRODUCTION

Recent escalation of robotic arm utilization in variegated fields such as in healthcare and medical environments, manufacture industries, and home services has led to a more advanced development of its manipulation strategy for complying dynamic and unstructured environments [1]. In many conditions, robotic arm or arm manipulator needs to deal with obstacles randomly show up on its way to finish its tasks. Hence a technique of trajectory planning with obstacle avoidance strategy is utterly significant to be developed for implementation in a real environment.

For instance, in time of health crisis impacted by the novel coronavirus (COVID-19) like present, robotic arm can be potentially employed to provide a contactless procedure in such a way it helps diminishing virus transmission. Robotic arm can assist the healthcare system in number of ways, such as for (1) general care: primary prevention and healthcare support, (2) inpatient care: acute and emergency care support, (3) non-COVID outpatient, home, and long-term care, and (4) medical education [2]. One of the most critical process is in the application of infectious material handling system. There are number of cases that front-liner healthcare workers were infected by the virus transmitted from the sample being taken. Therefore, for lowering the risk of infectious material handling which includes samples and waste materials

handling [3]. Trajectory planning with obstacle avoidance strategy is necessary to be utilized in those applications. The objective of trajectory planning is to control the displacement of end-effector from a start to a goal point (which is possibly via intermediate points) in a soft manner for a given time [4]. At the same time, obstacle avoidance technique is needed for a collision-free manipulation process [5]. Therefore, both techniques need to be combined to guarantee a smooth and safer manipulation of robotic arm for handling materials.

Reviewing previous research works on trajectory planning, two of the most popular approaches are trajectory generation in (1) joint or configuration space and (2) task space or cartesian space [6]. By using inverse kinematics, the end-effector position is transformed into joint angles representation, then a process of computation to find a smooth transition function from point-to-point can be done using polynomial functions (either cubic [6], quantic [7], or higher degree polynomials), or B-Spline [8]. For application of 3-DOF robotics arm, some existing research utilized Genetic Algorithm [9], Ant Colony Optimization [10] or Fuzzy Inference System [11] for solving higher degree trajectory generation in the presence of obstacle. However cubic polynomials trajectory generation has been mainly used as its simpler solver for a faster computation time. Regarding the technique for obstacle avoidance, some previous works suggested there are many methods which have been used, such as Artificial Potential Field [5], Law of Conservation of Energy (LCE) [12], Distance Calculation [13], Discrete Detection [14], Follow the Gap [15], and Signed Distance Function [16]. Each method has their own superiority among others, however in this research the method of distance calculation is used as it is suitable for utilization with distance sensor and a fixed geometry model of obstacle.

In this paper, a prototype of 3-DoF parallel link robotic arm has been developed to demonstrate the process of autonomous test tube handling system for infectious materials in a table-top environment (small scale). This prototype is the upgraded version from our previous development [17]. This prototype can be potentially utilized for assisting healthcare workers with contactless samples handling and manipulation either for analysis or short-distance delivery. In order to improve the performance of prototype to be deployed in real environment, a method of adaptable trajectory planning using cubic polynomials with obstacle avoidance using distance calculation is proposed. Proc. of 2020 7th Int. Conf. on Information Tech., Computer, and Electrical Engineering (ICITACEE)

# Finger Robotic control use M5Stack board and MQTT Protocol based

Puput Dani Prasetyo Adi <sup>1,2</sup> University of Merdeka Malang, *Malang, East Java, Indonesia<sup>1</sup>* Micro Electronics Research Laboratory, *Kanazawa University, Japan*<sup>2</sup> puputdani@merl.jp

Akio Kitagawa Micro Electronics Research Laboratory *Kanazawa University Kanazawa, Ishikawa - Japan* kitagawa@merl.jp Junichi Akita ifDL Laboratory Kanazawa University Kanazawa, Ishikawa - Japan akita@is.t.kanazawa-u.ac.jp

Abstract-In this research, remote robot hand control using (Message Queuing Telemetry Transport) MQTT Protocol and M5Stack Board. The purpose of this research is to develop remote control technology on the robotic fingers, the function of the robotic fingers is used as an actuator that works to control or perform certain jobs, for example, a robot that can press buttons automatically with remote control, or can adjust the volume, pressing the lever, catching the ball, giving symbols like counting abacus in mathematics, and other robot arm activities that can be developed remotely using internet technology. In general, the MQTT Protocol works by providing string input. Furthermore, the position of the servo angle is represented by the values x and y or  $\theta 1$  and  $\theta 2$ . The results of the analysis in this research consisted of blockly programming and python used to control the robot finger and activities on MQTT Brokers which consisted of publish and subscribe and how the packet data was in MQTT Broker.

Keywords-finger, robot, m5stack, MQTT, automation, mini servo

#### I. INTRODUCTION

Recently, the development of the Internet of Things (IoT) and its application in various fields continue to experience significant developments, in the world of industry known as the IoT-based Programmable Logic Controller (PLC), in the military world known as bomb squad robots, which are being worked on this research, furthermore, this research provides an approach to how bomb disposal robots can work. In the bomb disposal robot, the robot's hand works to pick and break the desired cable while to control the robot it needs to be seen that the robot's vision factor is using a camera, furthermore, the camera and hands are controlled through the IoT using an application and internet server. This research approaches the finger robot, the first step in building the more specific next steps. An important factor to consider when connecting to an internet network is the security factor [1] specifically for handling MQTT.

In research [2], MQTT is used on Passive Infrared (PIR) sensors connected to the M5 stack board and MQTT Broker, the approach is Smart home. MQTT is a very popular IoT protocol, but due to the large number of devices connected to MQTT Brokers, latency is undeniable, in research [3], developing MQTT with the term MQTT-ST, a protocol able to create such a distributed architecture of brokers, organized through a spanning tree. The protocol uses in-band signaling. In references [4], discussed the basic of MQTT, IoT [13],[14],[15], and Implementation and Analysis of QUIC for MQTT., MQTT-based IoT was also developed by references [5] which were applied to hospitals, a technology-based IoT will reduce the physical needs especially in health applications

in hospitals, for example checking the condition of the patient's body or checking up, to become an IoT-based technology [5]. In addition to the hospital, the MQTT-based IoT application is used to detect motorcycle accidents [6], the sensor used is an accelerator sensor to detect the tilt, and GPS to determine the accident's position in realtime.

#### II. BASIC THEORY

#### II.1 Finger motion Mathematic approach

Finger motion illustrates The finger motion of the robot is depicted in the planar two-link manipulator shown in Figure 1. furthermore, the forward kinematics can be determined using plane geometry in equations 1 and 2 [7].



Fig 1. Inverse kinematics of a planar two-link manipulator.

Where the x and y values are represented in equations 1 and 2.

$$\begin{aligned} x = l1\cos\theta 1 + l2\cos(\theta 1 + \theta 2) \quad (1) \\ y = l1\sin\theta 1 + l2\sin(\theta 1 + \theta 2) \quad (2) \end{aligned}$$

Values x and y are used to represent the values  $\theta 1$  and  $\theta 2$ . The polar coordinates in figure 1 are (r,  $\emptyset$ ), and  $\theta 2$  is determined from the value of r.

$$r = \sqrt{x^2 + y^2} \qquad (3)$$

In detail to determine the values of  $\theta 2$  and  $\alpha$ , seen in equation 4.

$$\theta 2 = \pi \pm \alpha. \quad \alpha = \cos^{-1}\left(\frac{l_1^2 + l_2^2 - r^2}{2l l l 2}\right)$$
 (4)

If  $\alpha \neq 0$ , there is a value of  $\theta 2$  corresponding to the radius, the second is called "Flip solution", which is shown by the dotted line in Figure 1b. furthermore,  $\emptyset$  is used to determine  $\theta 1$ . Equation 5 is a calculation at  $\theta 1$  and  $\beta$ .

$$\theta 1 = \operatorname{atan2}(y, x) \pm \beta \quad \beta = \cos^{-1}\left(\frac{r^2 + l_1^2 - l_2^2}{2lr}\right)$$
(5)

# Extended Planning Poker: A Proposed Model

Pantjawati Sudarmaningtyas Information System Department Universitas Dinamika Surabaya, Indonesia pantja@dinamika.ac.id Rozlina Binti Mohamed Faculty of Computing Universiti Malaysia Pahang Gambang, Malaysia rozlina@ump.edu.my

Abstract— Agile is the leading type of software development methodology and have a higher chance of success than non-agile projects. Collaborative and cooperative are characteristic of the Agile software development method. It is demonstrated by involving users actively, empower the team to make decisions, capture requirements in lightweight and visual, focus on frequent delivery of products through developing small, incremental release, and iterate. This characteristic is causing effort estimation remains the main challenge in agile software development. Planning poker is an effort estimation technique that applied extensively with the ability to empower all team developers to decide, especially in estimate effort. Still, the result is very subjective and takes a long time. This research proposes a new model to improve actual planning poker performance. A proposed model modify two parts of the planning poker is the estimation process and consensus process. Three variables added to the estimation process as well as implementing weight and score for its variables. The consensus process proposed done automatically based on five attributes that are related to the estimator.

Keywords—Planning Poker, Software Effort Estimation, Agile

#### I. INTRODUCTION

Agile is the leading type of software development methodology. Survey results indicated that 88% of respondents used agile for software development [1]. In manage software development, substantially Agile is quite different from the waterfall method. The main characteristic of the Agile software development method is the collaborative and cooperative approach between all stakeholders. It is demonstrated by involving users actively, empower the team to make decisions, capture requirements in lightweight and visual, focus on frequent delivery of products through developing small, incremental release, and iterate [2].

The agile projects had the chance of success 60% higher than non-agile projects [3]. Nevertheless, effort estimation remains the main challenge in agile software development projects because there were not yet commonly accepted standardized effort estimation techniques employ for agile software development. Expert opinion or expert judgment is the estimation method widely used in Agile [4].

In line with agile philosophy, planning poker is a lightweight manner and encourages the discussion among the developer team that acts as estimators; therefore Planning poker technique is frequently used for the estimation effort in Agile [5]. The development team of interdisciplinary involved in session planning poker that conducted at the beginning iteration of agile software development [6].

The planning poker is an iterative process that stops when all of the efforts of user stories has been done an estimate. Each iteration process of estimation effort in Planning poker started by a brief explanation from the user or product owner about one user story. When a story has been discussed thoroughly, so in a closed personally, each member is doing estimates by taking cards representing the efforts of the story. All cards are shown away at the same time, and when all the estimates show the equal value, then it becomes the agreed estimate value. If not, then do justification and further discussion for the lowest or highest estimates. After discussion, each member doing closed and personally estimates and cards are revealed again. This process is repeated until consensus is accomplished [7].

Advantage of Planning poker is empowered all team developer to make a decision, especially in estimate effort. Still, the process may take a long time when the project has a lot of user stories, causing recurs consensus in the estimation process. This study aim proposed a new model of Planning poker to improve Planning poker by overcome weakness in the process consensus. This paper organized into four parts is introduction, methodology, results and discussion, and conclusions.

#### II. METHODOLOGY

The expected result is achieved through three phases are study literature, analysis, and development. Fig. 1 show the methodology implemented in this study.



Fig. 1. Methodology

Study literature use to find out the software effort estimation applied in agile software development, explore the attributes that involved in the effort estimation, and genuinely learn about planning poker.

The analysis phase will select the relevant articles from the result from the previous stage; after that, evaluated the related articles. Development phase containing about how to build the model proposed based on the results of steps before.

#### III. RESULTS AND DISCUSSION

#### A. Literature Review

The literature review is conducted to find the articles of the journal or proceedings published between 2009 and 2019 written in English and have valid DOI. Result of search on seven resources shown in Table I. The three resources that high contribution in Agile software effort estimation are IEEExplore, SpringerLink, and ACM Digital library.