The Introduction of water quality sensor technology based on artificial neural network (ANN) systems to improve peoples understanding at Jakarta

Team Members:

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Dr.Rita Sundari  00101146408

Field of Mechanical Engineering
UNIVERSITAS MERCU BUANA
2021
VALIDITY SHEET

1. **a. Title of Report Community Services**
   : The Introduction of water quality sensor technology based on artificial neural network (ANN) systems to improve peoples understanding at Jakarta
   
   **b. Previous Research Title**
   : The New Lead (II) Ion Selective Electrode Based On Free Plasticizer Film of pTHFA Photopolymer

2. **Team Leader**
   
   **a. Name (with salutation)**
   : Sagir Alva, S.Si, M.Sc, Ph.D
   
   **b. NIDN**
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   **c. Functional Position**
   : Lektor
   
   **d. Faculty/Study Program**
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   **f. E-mail Address**
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3. **Team Member (Lecturer)**
   
   **a. Number of Members**
   : Lecture 1 person
   
   **b. Name/NIDN of Member I (with salutation)**
   : Dr. Rita Sundari (00101146408)
   
   **c. Name/NIDN of Member II (with salutation)**

4. **Team Member (Students)**
   
   **a. Team Member (Student)**
   : Student 2 person
   
   **b. Name/NIM of Student I**
   : Mas’ud Asadullah/55819010004
   
   **c. Name/NIM of Student II**
   : Ana Maulana Mus/ 55819120002

5. **Location of Activity**
   
   **a. Location/Activity Area**
   : West Jakarta
   
   **b. City/Province**
   : Jakarta

6. **Project Patner**
   : Universiti Kebangsaan Malaysia

7. **Output/Produced**
   : Increase understanding/skills

8. **Duration**
   : January 2022 – June 2022

9. **Source of Expenditure**
   
   **a. Source from PPM UMB**
   : IDR. 7.500.000
   
   **b. Source from Patner (In Kind)**
   : IDR. 7.500.000

Jakarta, February, 9th 2022

Signed by,

Head of Postgraduate of Mechanical Engineering Department

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NIP/NIK:

Team Leader

(Sagir Alva, S.Si, M.Sc, Ph.D)
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Approved by,

Beureau Head of Research, Community Service and Publication

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ABSTRACT

Water is one of the basic needs needed by humans and other living things. In addition, in many events and processes in nature and the environment that involve water, both occur naturally or intentionally. So the presence of water is very important. To meet the demand for water, water quality must be maintained properly. One way to control water quality is measurement using various types of sensor technology. In general, sensors can only measure water quality at certain levels and conditions. Because, indeed, one of the basic characteristics of the sensor is that the sensor is not universal or works for every measurement distance or every condition. Meanwhile, in certain circumstances, hazardous materials are actually outside the measurement distance from the sensor, making it difficult to detect by the sensor. For that, it is necessary to add an artificial neural network system (ANN). This system is able to extend the measurement distance from a sensor so that it becomes more sensitive and accurate. Until now, there are still many people around Jakarta who do not understand this. Because of this, the author took the initiative to make this community service entitled "The Introduction of water quality sensor technology based on artificial neural network (ANN) systems to improve people's understanding in Jakarta". This activity will involve various stakeholders such as students, students, lecturers and researchers around the city of Jakarta. This activity is carried out online, where in the process, apart from an introduction to how ANN can improve sensor performance in monitoring water quality, there will also be a question and answer session about the title.

Keywords: Sensor, artificial neural network, ANN, water quality
1.1 Situation Analysis

Jakarta is the largest city in Indonesia, where Jakarta is also flanked by several satellite cities such as Depok, Bogor, Bekasi, and Tangerang. Besides that, the city of Jakarta is also flowed by 13 rivers, both large and small. As the largest city and capital city, many people from other parts of Indonesia come to seek livelihood in Jakarta. This causes Jakarta to become congested, and many people also live in riverside areas.

Besides that, in Jakarta and its surroundings there are also many developing industries. The large number of people and industry, in the end, has put pressure on the quality of clean water around Jakarta. Meanwhile, water is a basic need of humans and other living things. In addition, in many events and processes in nature and the environment that involve water, both occur naturally or intentionally. So the presence of water is very important. To meet the demand for water, water quality must be maintained properly.

One of the technologies that can be used to measure and monitor water quality quickly, easily and cheaply is to use sensor technology. This technology has been developing for quite a long time, and its development is accelerating since the late 1960s until now. In general, sensors can only measure water quality at certain levels and conditions. Because, indeed, one of the basic characteristics of the sensor is that the sensor is not universal or works for every measurement distance or every condition. Meanwhile, in certain circumstances, hazardous materials are actually outside the measurement distance from the sensor, making it difficult to detect by the sensor. For that, it is necessary to add an artificial neural network system (ANN). This system is able to extend the measurement distance from a sensor so that it becomes more sensitive and accurate. However, until now, there are still many people and stakeholders in Jakarta who do not really understand how ANN can improve sensor performance in monitoring water quality. This technology is in accordance with RIP UMB 2021-2025 regarding environmentally friendly engineering technology.
At Mercubuana University, especially in the mechanical engineering department, sensor technology as well as ANN have developed in recent years. So this will really help stakeholders around Jakarta in an effort to improve understanding of how ANN can improve sensor performance in monitoring water quality. This activity will involve various stakeholders such as students, students, lecturers and researchers around the city of Jakarta. This activity is carried out online, where in the process, apart from an introduction to how ANN can improve sensor performance in monitoring water quality, there will also be a question and answer session about the title.

1.2 Partner’s Problem

1. There are still many people and stakeholders in Jakarta who do not really understand how ANN can improve sensor performance in monitoring water quality.

2. How to increase public understanding of how ANN can improve sensor performance in monitoring water quality.
CHAPTER II

SOLUTIONS AND OUTCOME TARGETS

Based on the analysis of the problems raised in chapter 1, there will be a community service activity in Jakarta that involves various stakeholders such as students, students, lecturers and researchers around the city of Jakarta. This activity is carried out online, where in the process, apart from an introduction to how ANN can improve sensor performance in monitoring water quality, there will also be a question and answer session about the title.

It is hoped that with this activity, the understanding of the community and stakeholders around Jakarta will increase. Thus, the community and stakeholders will be able to more easily participate in increasing their role in maintaining water quality in the environment where they live. The details of the output can be seen in Table 1 below.

Table 1. Solution and Outcome Target

<table>
<thead>
<tr>
<th>No</th>
<th>Type of Output</th>
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<tr>
<td>1</td>
<td>Scientific publication in the journal / proceedings1)</td>
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<tr>
<td>2</td>
<td>Publication on mass media (print / electronic )2</td>
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<tr>
<td>3</td>
<td>Increased turnover in partners engaged in the economic sector 3)</td>
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</tr>
<tr>
<td>4</td>
<td>Improving community understanding and skills 3)</td>
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</tr>
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<td>Increased peace / public health (general public partners) 3)</td>
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<td>7</td>
<td>Services, models, social engineering, systems, products / goods 4)</td>
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<tr>
<td>8</td>
<td>Intellectual property rights (patents, simple patents, copyrights, trademarks 6)</td>
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</tr>
<tr>
<td>9</td>
<td>Textbook 6)</td>
<td>N</td>
</tr>
</tbody>
</table>
CHAPTER III
IMPLEMENTATION METHOD

3.1. Goals Of Targets

The targets of this activity various stakeholders such as students, students, lecturers and researchers around the city of Jakarta.

In practice, This activity is carried out online, where in the process, apart from an introduction to how ANN can improve sensor performance in monitoring water quality, there will also be a question and answer session about the title.

3.2. Purpose of Activities

This activity aims to increase the understanding of the community and stakeholders in Jakarta and its surroundings how ANN can improve sensor performance in monitoring water quality.

3.3. Benefits Of Activities

This activity can be a means of education for the understanding of the community and stakeholders around Jakarta will increase. Thus, the community and stakeholders will be able to more easily participate in increasing their role in maintaining water quality in the environment where they live.

3.4. Framework For Troubleshooting

Water is one of the basic needs needed by humans and other living things. In addition, in many events and processes in nature and the environment that involve water, both occur naturally or intentionally. So the presence of water is very important. To meet the demand for water, water quality must be maintained properly. One way to control water quality is measurement using various types of sensor technology.

In general, sensors can only measure water quality at certain levels and conditions. Because, indeed, one of the basic characteristics of the sensor is that the sensor is not universal or works for every measurement distance or every condition. Meanwhile, in certain
circumstances, hazardous materials are actually outside the measurement distance from the sensor, making it difficult to detect by the sensor. For that, it is necessary to add an artificial neural network system (ANN). This system is able to extend the measurement distance from a sensor so that it becomes more sensitive and accurate.

Artificial Neural Network or artificial neural network is a computing system in which architecture and computing are inspired by knowledge of nerve cells in the brain. ANN is a model that mimics the workings of biological neural networks. By carrying out the learning process, the artificial neural network can regulate itself to produce a consistent response to a series of inputs. Artificial neural networks are designed and trained to have human-like abilities.

Each neuron can have multiple inputs and have one output. The input path on a neuron can contain raw data or data processed by previous neurons. While the output of a neuron can be either the final product or the input material for the next neuron as shown in Figure 3.1 below.

![Artificial Neural Network](image)

Figure 3.1 Architecture of ANN

The artificial neuron network consists of a collection of groups of neurons arranged in layers, namely:

a. The input layer functions as a network liaison to the outside world (data source). These neurons don't do anything to the data, just pass this data to the next layer.

b. Hidden Layers, namely, a network can have more than one hidden layer or even none at all. If the network has several hidden layers, then the lowest hidden layer receives from the input from the input layer.
Output Layer The working principle of this layer is the same as the working principle of the hidden layers, and the sigmoid function is also used. But the output of this layer is considered as the output of the process.

3.5. Evaluation Design

At the end of the online implementation, participants will be given a questionnaire to measure the level of participants' understanding of the community and stakeholders in Jakarta and its surroundings how ANN can improve sensor performance in monitoring water quality.
CHAPTER IV
BUDGET AND ACTIVITIES SCHEDULE

4.1 Budget from UMB

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<th>No</th>
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<td>2</td>
<td>Implementation Preparation (Preparation of Preparatory Materials)</td>
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<td>3</td>
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<td></td>
<td>Documentation, Banners, Honorarium Instructors)</td>
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<td>4</td>
<td>Making Activity Report</td>
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4.2 Budget from Partner (inkind)

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<td>Initial survey (Meeting, Supplies, Field Survey, Transportation</td>
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<td><strong>Amount</strong></td>
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4.3 Activities Schedule

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<th>4</th>
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References


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Attachment: Biodata
DAFTAR RIWAYAT HIDUP

A. Identitas Diri

<table>
<thead>
<tr>
<th>No</th>
<th>Nama Lengkap (dengan gelar)</th>
<th>Sagir Alva S.Si, M.Sc, Ph.D</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Jenis Kelamin</td>
<td>Pria</td>
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<td>3</td>
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<tr>
<td>5</td>
<td>NIDN</td>
<td>0313037707</td>
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<tr>
<td>6</td>
<td>Tempat dan Tanggal Lahir</td>
<td>13 March 1977</td>
</tr>
<tr>
<td>7</td>
<td>E-mail</td>
<td><a href="mailto:sagir.alva@mercubuana.ac.id">sagir.alva@mercubuana.ac.id</a></td>
</tr>
<tr>
<td>8</td>
<td>Nomor Telepon/HP</td>
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</tr>
<tr>
<td>9</td>
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B. Riwayat Pendidikan

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<th>Bidang Ilmu</th>
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C. Pengalaman Riset Dalam 5 Tahun Terakhir

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3. Penghargaan dalam 10 tahun Terakhir (dan pemerintah, asosiasi atau institusi lainnya)

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<th>No</th>
<th>Jenis Penghargaan</th>
<th>Institusi Pemberi</th>
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Semua data yang saya isikan dan tercantum dalam biodata ini adalah benar dan dapat dipertanggungjawabkan secara hukum. Apabila dikernudian hari ternyata dijumpai ketidaksesuaian dengan kenyataan, saya sanggup menerima sanksi.

Demikian biodata ini saya buat dengan sebenarnya untuk memenuhi salah satu persyaratan dalam pengajuan Usulan Pengabdian Masyarakat.

Jakarta, 04 November 2020

Pengusul,

(Sagir Alva S.Si, M.Sc, Ph.D)
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