ANALYSIS AND DESIGN SYSTEM FOR EEG BASED ON DECISION SUPPORT SYSTEM (DSS) HIGHER EDUCATION RESEARCH AND INDUSTRY (RAPID)

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Abstract— Classification of EEG wave signal into diagnose the disease is still rarely investigated. This approach tried to do research on "Analysis and Design EEG System Based On Decision Support System (DSS)" trying match the pattern of the waves on the EEG diagnostic data archival applications with common signs and symptoms. This paper attempts to explain the signal pattern recognition techniques EEG (electroencephalograph), reported signs and symptoms use the Decision Support System (Decision Support System). Decision Support System (DSS) on the introduction of the EEG signal is to distinguish between patients with normal and pathological (abnormal), and then differentiate into 15 classification pathology of the disease. The use of engineering Decision Support System (DSS) in the EEG signal analysis because of, the lack of availability of neurologists to analyze EEG signals, especially in remote areas. It would be very beneficial, especially in where for analyzing EEG signals difficult to be done directly by a specialist Neurology. Therefore, diagnosis may be assisted by a Decision Support System (DSS).

Keywords— Decision Support System (DSS), EEG, Waveform.

I. INTRODUCTION

Decision Support System (DSS) has been widely utilized in primary health care[1]. Benefits provided from the use of DSS among other things, reducing the human error factor (human error) in decision-making. For example in the DSS system, provided the options the possibility of a decision by users selected based on the real conditions of those times. DSS system will then display the results right on the possibilities. DSS has become a powerful tool for solving problems in automation and reduce human error. Part of the Decision Support System that works more effectively and automatically but requires a high complexity is artificial neural networks. Neural networks are inherently can deduce what needs to be done by simply observing the data that is representative of a process that will be implemented[2].

Artificial neural networks have been widely applied in various computer applications in the context of visual processing (imaging) [3]as screening tools in clinical medicine MRI, CT, X-ray, ultrasound, PET, and SPECT . The checker tool has been believed to produce reasonably accurate examination and generate tens of images per patient. This is a routine examination in the medical field. The results or output produced by the screening tool either in the form of photographs or graphics are very heavy workload for medical professionals who have to sift through these images to identify abnormalities. Computer Applications Decision Support System (DSS) was developed to fill this shortcoming. Target computer applications DSS made to be revealed abnormalities or pathologies in medical images

Pathology is the study of disorders (diseases). At routine check EEG pathology targeted to detect abnormal electrical activity in the brain.

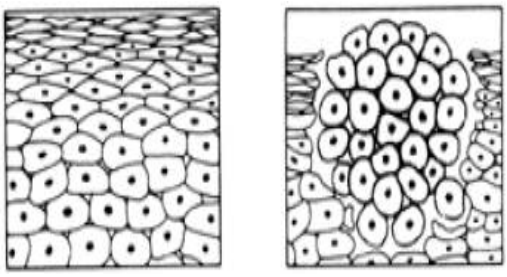


Figure 1:Normal cells form and pathologic.

Organs and tissues are made up of small sections called cells. Cancer is a disease of these cells. For some reason, the process of getting out of control growth, the cells will continue to divide, developing into a lump, called a tumor, as shown in Figure 1. Tumors can be benign or malignant. In benign tumors, the cells do not spread to other parts of the body and therefore it is not cancer[4]. A malignant tumor consists of cancer cells, which have the ability to spread beyond its original site. There are many methods used to diagnose tumors, these methods include magnetic resonance imaging (MRI) scans,

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CAT computerized axial tomography (CT) scan, angiogram or electroencephalogram (EEG).

II. DETAILS EXPERIMENTAL

2.1. Materials and Procedures

Elektroencephalographs is a science that studies the image of recording electrical activity in the brain, including the EEG recording techniques and interpretation.Gelombang EEG is the wave of the electricity generated by the brain's nerve signals that indicate information such as brain activity. Using the analogy like a river flowing, the goal is not to measure the height from the bottom to the surface, but rather to measure the ripple on the surface. There are basically four types of waves in the EEG signal, ie delta, theta, alpha and beta waves. Delta waves, with a frequency of less 4Hz and theta wave frequencies between 4 and 8Hz, this is a slow wave, while the alpha wave range (8 - 13Hz) and beta wave band (> 13Hz) is a quick wave. Alpha waves is considered the standard waveform in normal patients. Figure 2 shows the part of the patient's normal EEG graph arrested for a few seconds .

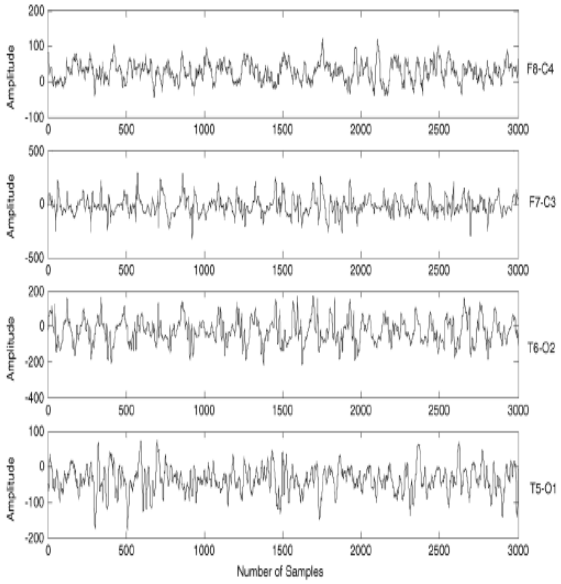


Figure 2. A Normal EEG Graph.

Abnormal form of EEG waves typically in the form of a spike, sharp wave and slow wave complex as well as appearance. These patterns occur within different wavelength assist neurologists in identifying normal and abnormal patient. EEG examination is indispensable for the diagnosis of tumors and epilepsy. Epileptic waveform is similar to idiopathic normal waveform such as spike, sharp wave and slow wave complexes. Between normal waves and slow waves appear disorganized and disrupted wave background as illustrated in Figure 3. The normal waves sometimes appear isolated in the limited or continue the entire waveform. Conditions produce different wave in each case

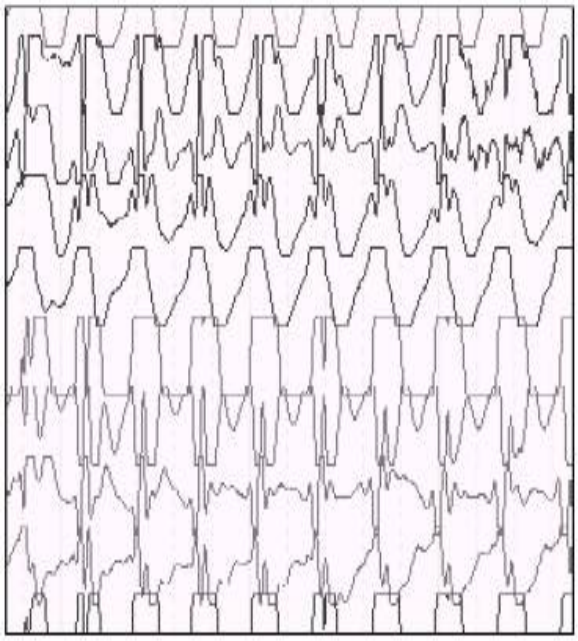
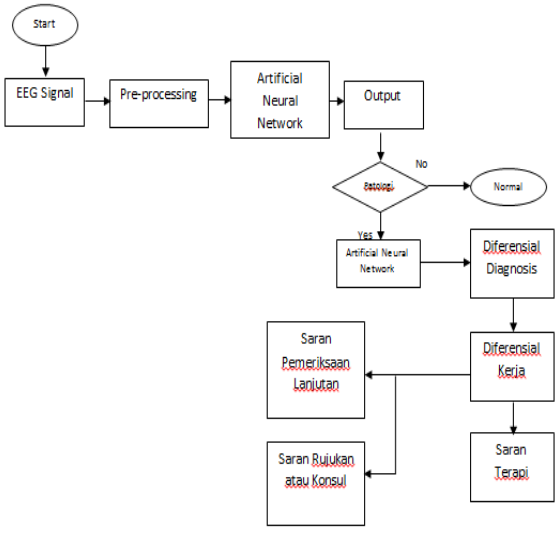


Table 2: YSZ top coat Spraying for bond coat

2.2. Decision Support System (DSS) padaKlasifikasigelombang EEG

EEG samples are projected to be able to distinguish the normal from patients with that of patients with pathology. EEG signals show different patterns and waveforms corresponding physiological events.



Gambar 5 : Block Diagram

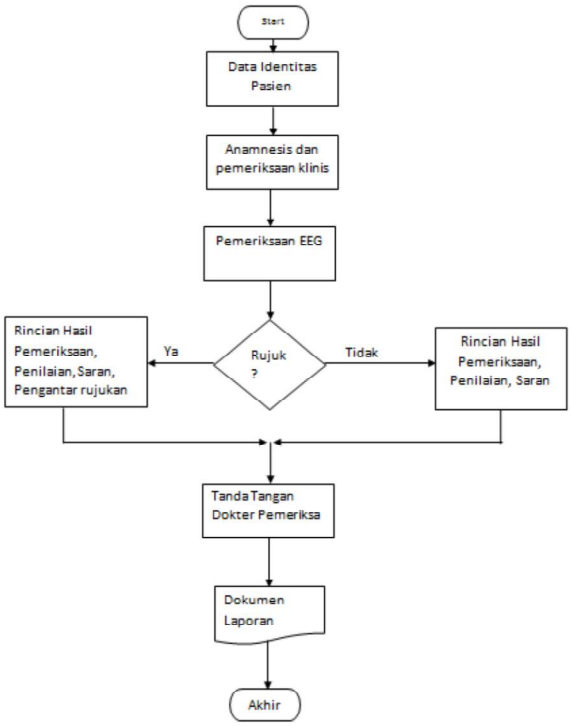
Thus the form of the proposed system design, research EEG waves to diagnose.

2.3. PengertianPatologi

Pathology (abnormal pattern) is meant here is all the wave EEG activity was not correlated with the age and condition of the patient. Abnormality can be categorized into two types, namely:

1. Non epileptiformAbnormal pattern
2. Epileptiform Pattern

Flowchart of System General Examination



Gambar 6: Flowchart pemeriksaan EEG Umum.

III. RESULTS AND DISCUSSION

3.1. DSS Based on EEG Examination

The analysis and design system create above, resulted in web based application on guiding the path of diagnosis. This application provides step by step symptom and sign of pathology that can detect by EEG waveform. So that the diagnosis can be perform at most remote area or by telemedicine concept.

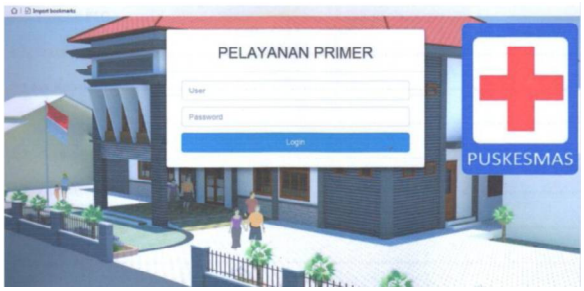


Figure7.DSS Application

3.2. Direct Connect With EEG-Lab

This system provides guidance based on symptoms and sign that correlate with EEG wave pattern. So that the diagnoses following the signs and symptoms available in system. The guidance is composing independently by admin using collection of resource symptoms and sign correlated.

In addition, the system connected directly with EEG-Lab, with just one click the EEG-Lab will appear complete with all the functionality included. With this system no need to change windows to open EEG-Lab. EEG-Lab is the most open EEG viewer available. It's open and free to use.

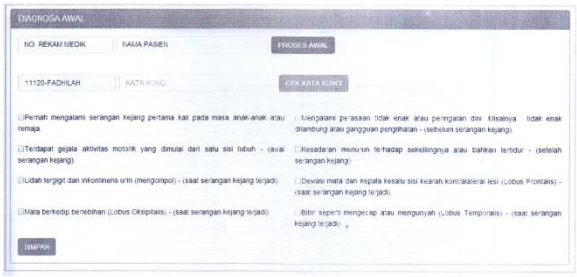


Fig.8. Symptoms and sign that provided

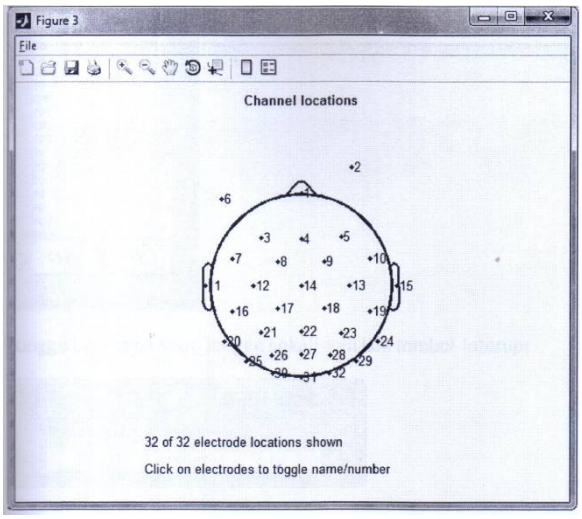


Fig.9.Electrode placement based on number.

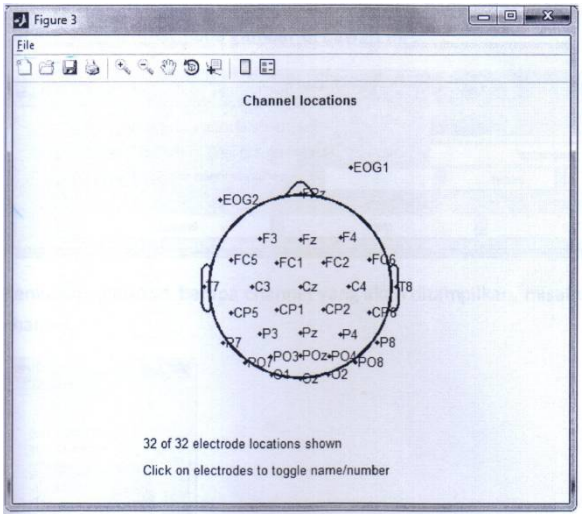


Fig. 10.Electrode placement based on alphabet numerical. Used as guidance for future physician in medical education curriculum.

CONCLUSIONS

The use of this DSS system can be explain by this mentioned item:

1. In this case, can reduce wrong diagnosis just by using EEG waveform. So that future physician can use this system as training inside medical curriculum.
2. Disparity of medical practitioner on rural area can be solving using this kind of system that work online on Telemedicine scheme.

ACKNOWLEDGMENTS

This research will be continuing by real placement on rural area at first level health facilities. There for will be more gain information about the ability and deficiency of actual practice.

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