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COMPUTER VISION TO SUPPORT PRE-SERVICE TEACHER MASTERY OF STUDENT CENTRE APPROACH

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Abstract. Various researcher state that to ensure student had the 4Cs competence is to use student-centered approach in the classroom. This further recognize the skills to create dynamic classroom as the core-skills of 21st teacher. To create such classroom, a teacher must be able to master the systematic and dynamic aspects of learning. It requires teacher to fully aware of every student activity. However, based on preliminary investigation, there two things that become obstacles, namely: (1) teacher had hard time giving full attention to whole classes due to non-coercion manner of student-centre approach, and (2) mastery of dynamic aspects in learning requires real experience which will certainly spend a lot of time. They need practical solutions that can help them master the core skill of 21st teacher. Therefore, we designed an application with image processing features (face detection, face recognition, and pose extraction) in order to help teachers to give full attention and provide positive reinforcement for every classroom participant. The research is done by R&D Method, whereas application design uses SDLC method. The results are product in the form of software applications that are expected to accurately measure percentage student attention in the classroom. Product also present information as a basis for decision making to assist teacher in creating a dynamic classroom. In addition, we certainly hopeful that by using the product, prospective teachers can quickly adapt and apply the dynamic classroom.

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A. INTRODUCTION

Learning is a systematic and dynamic process. The systematic process of learning includes compiling a learning implementation plan, learning materials, analysing student character and needs, etc. The results of this systematic preparation are applied dynamically in learning in activities such as classroom management, classroom discipline, question-and-answer etc. Therefore, in order to maximize the process of giving competence to students through learning activities, a teacher must be able to master systematic and dynamic aspects of learning.

The 21st century industry is increasingly describing that the competencies needed are the 4cs, namely collaboration, creativity, communication, and problem solving. The 4cs are included in the High Order Thinking Skills domain based on the bloom taxonomy. Many researchers state that to ensure that students have the 4Cs ability, the Student-

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centre Approach (ScA) is used in teaching and learning activities. In classroom management, ScA uses a self-discipline model, such as hierarchical needs, reality therapy, moral reasoning, etc. This self-disciplined model is based on the effective relationship between teacher-student and student-student.

Many researchers have given recognition that dynamic classroom or dynamic classroom management is the core-skills of 21st century teachers. To be able to create a dynamic classroom, students must always focus during learning activities and teachers must be able to give full attention to every student activity. However, based on the results of our previous research, there were two obstacles, namely (1) the teacher had difficulty paying full attention to the whole class due to the non-coercion factor of the self-discipline model used in the ScA and (2) mastery of dynamic aspects. in learning requires real experience in the field which of course will take a lot of time. We conclude that prospective teachers or new teachers need practical solutions that can help them acquire the core skills of 21st century educators.

Therefore, we designed an application with image processing features (face detection, face recognition, and pose extortion) to help teachers give full attention and positive feedback to all students. The design technique for Face Detection uses the Viola-Jones algorithm framework (Viola, 2001). As for measuring student attention, use pose extraction which is aimed at the orientation of the head and the view. The results of Stiefelhagen's (2002) study state that the orientation of the head and the viewpoint 88.7% determines the focus of one's attention. Thus, the application is expected to increase the accuracy of the calculation of student attention.

B. METHOD

Product development uses the Research and Development (R&D) method with a procedural scheme from Akker (1999). The procedure scheme consists of 4 stages, namely:

(1) Preliminary investigation

A systematic and intensive preliminary examination of the problem includes:

a. Literature review,
b. Expert consultation,
c. Analysis of sample availability for related purposes,
d. Case studies of common practice detailing needs.

(2) Theoretical embedding

More systematic attempts are made to apply the knowledge base in articulating the theoretical rationale for de-

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sign choices. At this stage, the application design is carried out using the SDLC method.

(3) Empirical testing (empirical testing)

Clear empirical evidence shows about the practicality and effectiveness of the intervention. At this stage, a formative evaluation is carried out based on Tismirr modification.

(4)Process and results of documentation, analysis and reflection (documentation, analysis, and reflection on process and outcome). Its implementation and results will contribute to the specification and expansion of the research design and development methodology.

C. FINDINGS

We currently at the stage of Theoretical embedding. We conclude that the most revered image processing viola -jones algorithm will be used as foundation of our application. n the Viola-Jones algorithm framework, many libraries are provided for the feature selection process.

Face Detection & Recognition

This feature selection is a basic function to improve the selection process known as three main elements, namely Integral Image, Adaboost and Cascade classifier. Viola (2001) states, *"The first is the introduction of a new image representation called the "Integral Image" which allows the features used by our detector to be computed very quickly. The second is a learning algorithm, based on AdaBoost, which selects a small number of critical visual features from a larger set and yields extremely efficient classifiers. The third contribution is a method for combining increasingly more complex classifiers in a "cascade" which allows background regions of the image to be quickly discarded while spending more computation on promising object-like regions"*. Those, the face detection algorithm design for the product to be developed is illustrated in Figure 1:

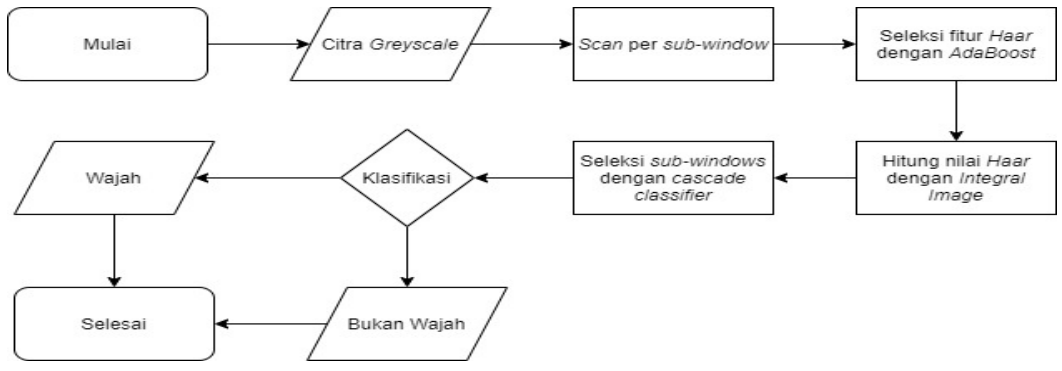

Figure 1. Face Detection Algorithm

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Pose Extraction

By knowing the position of the eyes, nose, and mouth, it can be determined whether the facial pose being analysed is in a standard position or not. For example, if the vertical coordinates of the left and right eyes are not the same, then the face is in an oblique position with the roll angle not equal to 0. Likewise, the horizontal coordinates of the nose and mouth are not the same, then the face is also on its side with different roll angles. with 0.

The size of the eye can also be used to determine whether the face forms a yaw angle to the frontal or not. Meanwhile, the vertical position of the eyes and mouth can be used to determine whether the face forms a pitch angle or not. Thus, facial landmark detection is one step of this facial pose tracking subsystem. The design of the pose extraction algorithm for the product to be developed is illustrated in Figure 2:

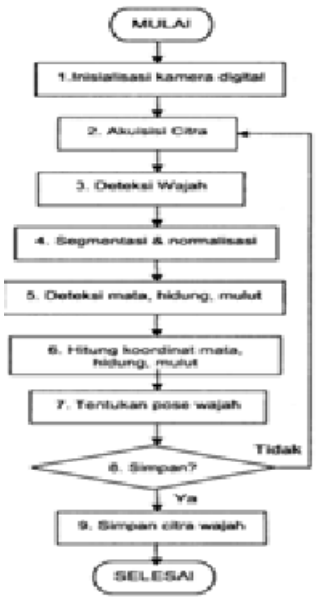

Figure 2. Pose Extraction Algo-

Conclusions

To realize dynamic classroom management, teachers must pay attention to 3 main aspects, namely norms, authority, and attention. Of the three factors, teachers often have difficulty in the aspect of attention. Therefore, we need a solution that can solve these problems. One practical solution that can be done is to take advantage of technology from digital image processing. The image processing must be able to detect how much attention the student give during classroom activities.

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