

Application of Learning Vector Quantization Method in Kinect Device AS a Base of the Development of Behaviour Detection System

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Abstract. Arianto E, Rahmawati L. 2017. *Application of Learning Vector Quantization Method in Kinect Device AS a Base of the Development of Behaviour Detection System. Proc Internat Conf Sci Engin 1: 171-174.* One of the lessons for mental disorder students in Special Schools is practicum lessons in the form of vocational education. This lesson uses equipment that requires prudence. Mental disorder students have characteristics that are low memory and move based on intuition. Teachers should pay extra attention especially to detect student behavior during the learning. This detection is needed for learning to take place smoothly and students are safe from the dangers around the practicum place. Teacher's feedback on the detection obtained in the form of a warning from the teacher. This study is expected to be useful for providing a special detection pattern for students to assist teachers by providing feedback in the form of warnings using natural motion detection technology. This research was conducted using Kinect as data input and data was processed using artificial neural network and Learning Vector Quantization method. The dangerous attitude used in the test is the attitude of standing at the time of drilling position. The data used by training is 126 data and do training using LVQ. At the LVQ training stage, the training was conducted with parameter of Learning Rate 0,05, maximum Iteration 44, reduction of learning rate 0.01, and Learning rate minimum 0,02.

Keywords: Mental disorder, Learning Vector Quantization method, behaviour detection

INTRODUCTION

Indonesia is a country with abundant population. To make Indonesia as a developed country, education is given equally for its people, including Indonesian people with special needs. Students with special needs that have normal physical appearance are autism and mental retardation. In terms of psychology, children with autism have an educational focus toward psychology education and their IQ abilities are similar to normal people. While the mental retardation child has a low IQ and has other properties that are easy to forget and perceive information intuitively.

Students with special needs will be taught on skill activities. For example the skill activity at the school is the activity of wooden skill toy. The student will be taught to make an object of wooden craft which is used to hone their skill. Materials used by students of wooden skill include wood, paint, paint thinners, glue, and other substances that potentially dangerous if not placed as it should be.

These materials, if not properly placed, are cause the floor to be slippery. In practicum of wooden skill, students use tools and materials such as grinding machine, winding machine, sandpaper machine, lathe, welding screwdriver and other equipment that must be careful in its operation and accompanied with good attitude. In the use of these tools, the children are in a special room where the space is devoted to the activities of practicum children. Such practicum activities are in the workspace, which has the same principles as the work area in the industry and has rules governing workers in those work areas to be in a safe condition,

not endangering themselves or others. Suppose that in the regulation there are some restrictions used to ensure the safety of workers, ie prohibited from running, prohibited bersendagurau, prohibited smoking and other prohibitions in accordance with the same work area. The same experience has advantages in children who have graduated so they are not awkward if they enter the work area in the industry and can behave as it should.

In education today it is certainly not only cognitive that plays an important role for a child's pendidikan. Aspects that are not less important is the affective side. This aspect can be attributed to the character education that is currently included in the education curriculum indonesia. According to (Mardapi, 2010), Characters that are always associated with character education are often used to state how well a person is. Or in other words, a person who displays personal qualities that match the desired community can be expressed as having good character and developing character qualities are often seen as educational goals.

According to Mardapi (2010), character is part of affective domain, and one of method that can be used to measure affective aspect, that is observation method. The use of observational methods is based on the assumption that affective characteristics can be seen from the behaviors or deeds displayed, psychological reactions, or both. According to Wiyani (2012), the strategic role of teachers should be optimally utilized to minimize the negative effects that exist. We see together, one uru in the classroom will involve many students. Teachers will have difficulties when supervising large numbers of students. The role of the teacher as an individual reminding students in character

education to ensure that students do not behave negatively is the main task.

Hoffingger (1996) concludes that when we hear something, it does not mean we listen. and do not need to hear to learn, but we must listen to learn. We do not have to learn to listen, but we must learn to listen. Listening involves concentration. So, if the students are given an audiovisual feedback, it will give not just attention but concentration.

From these conditions, it is necessary to detect the activities of students with special needs when doing activities in the work area. The detector will detect the students' special needs from the negative characters and provide a warning if it detects a negative activity. The proposed system is also expected to be as interesting as an interesting learning medium. So hopefully with the warning, the negative activity is not a habit of character for students with special needs.

MATERIALS AND METHODS

System Design

In designing required a device that can detect patterns of student behavior. These devices can use kinect devices. In practice kinect will be connected to a PC equipped with algorithms to detect behavior patterns of students with special needs. The PC is also used to provide feedback output from malicious movement in the work area of audio visual.



Figure 2. Motion detection scheme.

The process of working this system based on the sensor to detect the student's body position. Kinect processes motion using software that detects certain movements and generates output responses in the form of text and audio visuals.

Normal Data Collection

In this section, experiments are made of normal daily activities. And the system will record the normal state data that will be used to evaluate the abnormal / dangerous situation. System embedded script program which will record the existing activity in the space, movement between point to point, detection of body position in normal circumstances. a natural motion detection sensor can be placed in a room for detecting

daily life activities as for detection sensor placement shown in figure 3. In the figure there are markers, markers A, B, C, D, E, F where A, C, D, E is the area that can be detected natural motion detection sensors, while B and F is an area that can not be detected sensors. V. Gulshan's (2011) research describes the kinect can be embedded algorithm to record the data set taken as the main data.

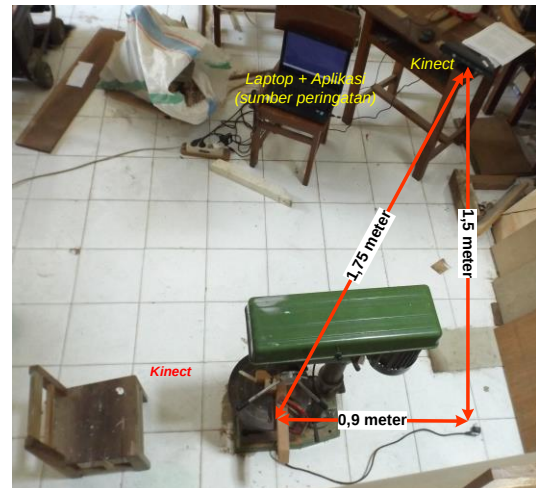


Figure 3. Image of sensor placement on space.

Evaluation Procedure

The system will compare the normal state of activity data set, and will be compared with the sensor detection at that time. Abnormal circumstances will be evaluated and warnings will be recorded to the system.

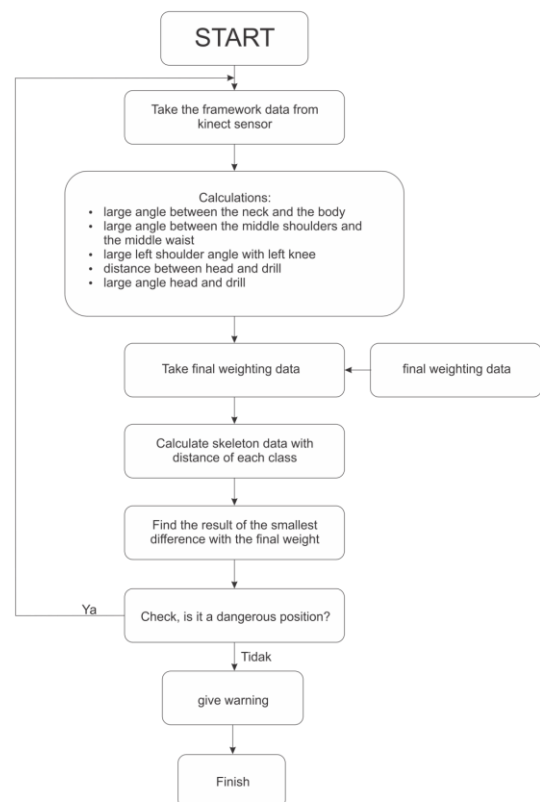


Figure 4. Flow chart of the detection system.

RESULTS AND DISCUSSION

In this process the researcher determines the training parameters such as Learning Rate, maximum Iteration (max epoch), learningrate reduction (Reduce LR), and

minimum Learning rate (Min LR). In determining these parameters the researchers monitor what data on the status of existing learning in the application. In the learning process is determined as follows:

Table 1. Data table late weight of LVQ training results.

id	Neck	Degree shoulder-waist	Degree Shoulder- Left knee	Distance drill head	Degree drill head	Class
1	33,20912	13,84478	37.0738	52,97953	32,89481	1
2	63.66706	51,43	25,04137	55.6553	14.87935	2

To find out the percentage index showing the ability of this diagnostic system to classify normal and dangerous attitudes, a test is required, including sensitivity, specificity, and accuracy testing. The accuracy of the system is used to indicate the level of performance accuracy.

$$\text{Accuracy} = \frac{TP + TN}{TP + TN + FN + FP} \times 100\% \quad (1)$$

With:

- TP (*TruePositive*) is to point to the number of dangerous attitudes that are correctly grouped as dangerous.
- TN (*TrueNegative*) is to point to the number of normal attitudes that are correctly grouped as normal attitudes.
- FP (*FalsePositive*) is to refer to the number of which are classified as normal attitudes grouped as dangerous.
- FN (*FalseNegative*) refers to the number of groups that are classified as dangerous attitudes classified as normal.
- To obtain a percentage index that demonstrates the ability of this system to classify the degree of accuracy of attitude recognition, it must be considered how sensitivity and specificity are to be considered.
- Sensitivity is the percentage index probability of positive test results against the classification of accuracy of non-hazardous pattern

$$\text{Sensitivity} = \frac{TP + TN}{TP + FN} \times 100\% \quad (2)$$

- Specificity is the percentage index of test probability in classifying normal attitudes.

$$\text{Accuration} = \frac{TN}{FP + TN} \times 100\% \quad (3)$$

With TN (*TrueNegative*) is to point to the number of normal attitudes and show a normal attitude.

To find a percentage index that demonstrates the ability of a normal and dangerous attitude recognition detection system, a test is required to obtain sensitivity, specificity and accuracy data. Test results in mental disorder students on drilling process will get value TP (*TruePositive*), TN (*TrueNegative*), FP (*FalsePositive*), FN (*FalseNegative*). TP (*TruePositive*) is to point to a dangerous attitude that is properly grouped as a standing position. TN (*TrueNegative*) is to point to the number of children's attitudes with true positions that are grouped normally as normal. FP (*FalsePositive*) is to refer to the number of normal attitudes that are classified as positive (dangerous attitudes). FN (*FalseNegative*) is to point to the number of dangerous attitudes but classified as negative (normal attitude).

In this study using a sample derived from the attitude of students. Identification seen from the student's attitude and the results of the introduction of the application that has been made. Testing on this detection application get the results of attitude testing of 14 students with the results seen in Table 2.

Table 2. Detection application testing table.

No	Subject	TP	TN	FP	FN
1	Fuad	11	11	0	0
2	Purnomo	13	13	0	0
3	Agus	12	12	0	0
4	Topan	13	14	0	3
5	Risky	11	11	0	0
6	Andi	11	11	0	0
7	Ikhsan	11	11	0	0
8	Bayu	4	12	0	8
9	Reza	12	12	0	0
10	Gama	10	9	1	2
11	Anjas	11	13	0	1
12	Hari	10	11	2	6
13	Antok	6	8	0	2
14	Aldo	11	11	0	0
	Total	146	159	3	22

In Table 2, the results obtained that the application has an accuracy of 92.4%, sensitivity 86.90% and specificity 98.15%. So that it can be seen that in the LVQ training stage, the training was conducted with

parameter of Learning Rate 0,05, maximum Iteration 44, learning rate reduction 0.01, and Learning rate minimum 0,02.

CONCLUSIONS

In the LVQ training stage, the training was conducted with parameter of Learning Rate 0,05, maximum Iteration 44, learning rate reduction 0.01, and Learning rate minimum 0,02.

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