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Improving the Value of Lobster Selling with Grading Method Using Machine Vision Technology

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***Abstract*---**Lobster is a product of the fishery sector which has a very high selling value, fishermen in coastal areas, especially in the Pangandaran area, sell the catch on traditional markets and are exported overseas. The expensive lobster selling value is inversely proportional to the income received by fishermen, the problems faced are influenced by several factors, namely whether, fishing regulations, and technology used, lobster sales will increase if the sales process if fishermen can sort and sort lobster sized large, which has a very high export value, the problems faced by fishermen currently sell directly to the fish market or buyers without going through the grading process. The grading system can be done manually but this causes the lobster to become not fresh because of the fairly long sorting process. The sorting and grading system method is a must so that a sold lobster possesses export value and quality, some large fishermen use a very large and fairly expensive sorting tool and are only owned by

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fishermen with large capital as well as catching patterns and large-scale lobster production. In small fishermen limited to the number of catches and transport capacity.

Keywords---grading, learning, lobster selling, machine, vision technology.

Introduction

Machine vision technology is a method in which a computer is able to recognize an object or object by comparing previous training data, this technology is widely applied in various fields and is able to recognize objects with very high accuracy, in this study machine vision will be implemented to create a grading system and sorting on lobsters, the grading system will increase the selling value of the lobster in accordance with export standards, manual sorting systems will take a long time and cause lobsters to die and not fresh because they are piled up and move to storage. While fresh and still alive lobsters have high economic value. Therefore, an automatic sorting system is needed and has an affordable cost. In large-scale fishermen continue to develop a sorting system, but the system used is still grading with size parameters and lobster will accumulate on a conveyor machine which can cause the lobster's body to be damaged and deformed or broken (Lohr & Carey, 1999; Brunt et al., 1999).

Solution to the problem above was developed a sorting system using the help of a camera mounted on a pond or at the bottom of the sea where lobster habitat is alive, while in the lobster that is anchored this system is easier to use, input data will be taken from a waterproof camera or waterproof so that habitat lobster is not interrupted and the grading process can be done directly without damaging the shape and physicality of the lobster, which is most important when sold is still alive. The machine vision grading system is considered very appropriate in increasing export quality and lobster value where this algorithm method can also be used to identify the sex, size, and varieties of lobster itself, the machine vision system will be more intelligent and reliable with the help of Image Processing techniques where processed lobster data will be stored in a database and can be used for further research until the inch size can be read by the system (Livermore et al., 1997; Tomina & Takahata, 2012).

Theoretical basis

A growth monitoring system and underwater activities in a very wide area are useful to see fish activities and ecosystems for long-term needs, some countries have developed technology in the marine sector, the development is used for research activities as a process of supporting the management of fishing. The technology used is in the form of shooting below the sea, the technology becomes an alternative that can be used to see the number of fish and good fishing patterns, virtual information taken from a video camera has been implemented mainly in lobster, for example in Norway a camera-assisted monitoring system is successfully implemented with the ability Realtime shooting with camera placement stored in the lobster and fish area is alive (Correia et al., 2007).

Retrieval of underwater data is able to represent the growth and fish habitat of the system capable of working for a long time under the sea in addition to a computer vision technology (Zong & Zhen, 2021; Nyandra et al., 2018). in the country of Norway monitoring, the growth of lobster is used to estimate the type and number of lobsters that are under the sea, the monitoring system will send frame by frame data, the results of the calculation depend on the clearness of the equipment installed under the sea (Tan et al., 2014). The lobster sea business prospect still has very high potential so that the investment climate in the sale of sea lobster is still wide open, this has led to competition in the fishing industry entrepreneurs, especially to get export and import markets. the lobster sea itself or known by the name (Panulirus) is one of the fourth largest commodities according to data from the ministry and maritime affairs, so that marine business in the sale of lobster is wide open (Moksness et al., 1998).

The price of lobster tailors is around 170,000, - up to Rp. 250,000 / kg. This price is the price directly from fishermen and can still be increased according to the size, type, and physical condition of lobsters good or not defective, in Indonesia there are several types of crayfish or lobster, namely, rejuna shrimp (P. versicolor), king shrimp (P. longipes), rock shrimp (peniculatus), sculpture shrimp (P.homarus) and handicapped shrimp (ornatus), many of which live in coastal areas, especially the Javanese Pangandaran West and Gunung Kidul (Setyono, 2006). Lobster's value for export quality alone in the European Union has increased by around 5000 tons per year with prices reaching 10,000 Euros to 13,000 euros/tones, the ability to supply lobsters to European countries continues to be wide open, catching lobsters themselves are being monitored well from habitat and the place of capture, this is because to maintain a supply chain so that it can be utilized in a long run, in Europe countries lobster cultivation can use an Aquaculture concept that is cultivated in a tank, where 5 -80 lobsters are separated inside 10 modules, the number of tanks can be increased to 200 cages, the size of an adult lobster can weigh around 300 grams with a length of 20 cm (Posth et al., 2016).

To control a production and monitor lobster growth is to create a monitoring system automatically with daily monitoring mode, measurement parameters can use an image input that can read growth and water quality, the grading system on lobster is commonly called "plate-sized", size scale and the weight can be done automatically, the system is able to handle the growth of lobster up to 150 tons per year, this system does not require a large room and can be installed close to the building or area close to the beach and other seawater sources, the resulting product will maintain balance catches and reduce human error (Middlemiss et al., 2015). In human perspective and perspective a visual form is a process and interaction between eyes and memory, in a general sense computer vision means how an object or object can explain and have meaning, in other words, the composition of the human brain has a complex network and when this is called Computer vision, in the field of modern knowledge computer vision is a combination of a theory and an algorithm that is used to find useful information, a piece of information has three main stages, namely low level, middle level and upper level in the processing process (David, 1988).

In a field of computer vision color is an important attribute that can be used to identify information, in some defining factors and assessment of product quality implemented in the industry as an example to measure sharpness, type, texture and color change of an object (Acharya & Ray, 2005). Viewed from the perspective of machine vision or (MVS) or Computer vision system (CVS) is how to help the human view system to get information from an object that is observed without fission interactions with the object, machine vision itself is very complex which can consist of a combination of some tiger sensors that are connected to a particular software and algorithm (Davies, 2004).

Research Method

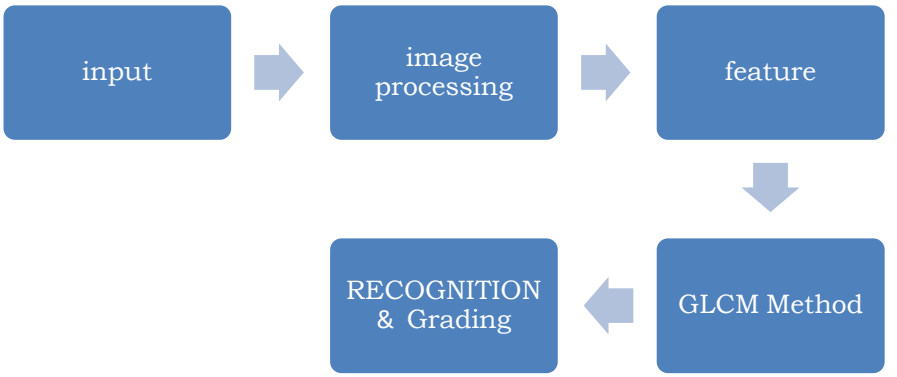

Figure 1. Lobtser grading method

Grading system with machine vision has several stages, namely:

- Input
  In the system above input is taken from a camera connected with sensors and servers, input will be used as material for calculating lobster growth parameters, the camera is stored at the top of the tank or pond.
- Image processing
  In this section lobster data that has been taken from the camera which is still in the format of video format is then changed to become partitions or frames, each image of lobster is then processed with image processing techniques according to system requirements.
- Feature extraction
  In this section the visual appearance of lobster is then processed to retrieve useful information, the information can be color, shape, size, and weight. calculation results will be displayed in the system visually in the form of grading.
- GLCM method
  In the visual data section taken will be sharpened, this method is carried out to take the unique characteristics of each lobster in the pond, the data will be used to measure the size of lobsters from head to tail, size data is

made in a display "cm" , measurement data is stored in the database for automatic grading.

- Recognition
  In this section lobster image, data will be recognized by each part and will be graded automatically, lobster divided into three parts, namely small, medium, super quality. With small quality classifications not yet worth harvesting, while medium-sized lobsters for local commodities and super quality for export. The grading system will be automatically displayed on the computer and can be immediately sorted by the farmer or still in the stages of monitoring lobster growth and development.

System implementation

In this implementation, the machine learning system will conduct a grading process (Menaka & Sankar, 2019; Aryani & Rahayuni, 2016). Automation of lobster located at the bottom of a pond or surface area, the system will do grading based on measurements from the lobster head to the tail in accordance with international standards.

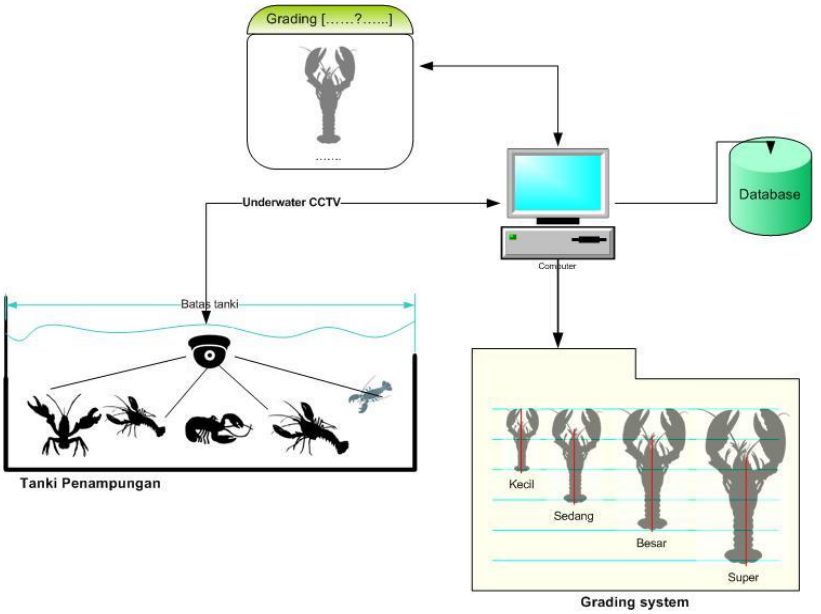

Figure 2. Sketch of a grading tool with machine learning techniques

In figure 2 is a representation of the configuration of the tool used to support the grading system, the system is composed of storage tanks containing several lobsters stored at the bottom of the tank, and the tank contents are adjusted to the lobster's condition and habitat so that the development of lobster growth is not disturbed (Kokorina et al., 2021; Sergeieva et al., 2021). The tank has a camera that is stored and operated for 24 hours, the camera functions to take lobster data to record the size and development of lobster, lobster size data is processed with image processing techniques and then converted with binary data and GLCM lobster data is then stored in the database, the value of size (Gunasekaran, 1996; Chen et al., 2002). The lobster is a parameter of

homogeneity, correlation. The value of each lobster will differ depending on the shape and size, after the data is stored the fishermen can see the development of lobsters with grading values that are automatically made with 'small' lobster grade values, lobster grade 'Medium', 'Big' Lobster Grade, Lobster Grade ' Super ', measuring lobster is measured from head to tail and can be done in real time. The grading system will automatically be displayed with a visual marking in accordance with the measured grading lobster.

Table 1
Testing of measurements with one lobster

Original Image	The results of the machine learning process	Description
		In the picture above is an experiment on machine vision technology in measuring one adult lobster, the lobster goes into superior quality with a length measurement reaching 19.60 cm, the lobster enters the lobster with superior quality, the measurements are carried out automatically with lobster ingredients still in the water and in living conditions.

Table 2
Testing of data collection for lobster grading samples

Image Input	Description
	In the second picture, lobster testing is carried out by means of clarity, the system is used to retrieve sample data by grading lobsters from the smallest to the largest, the system is still able to recognize and measure lobster sizes with high precision values and measurements are carried out virtually.

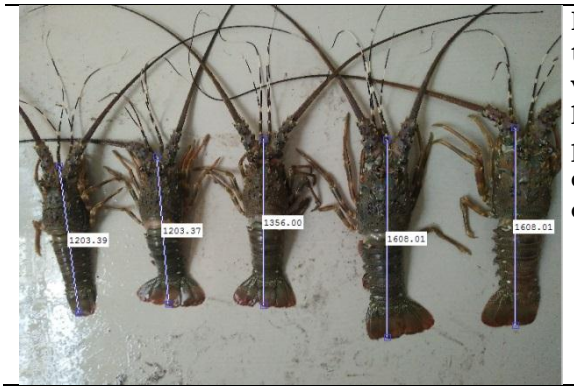	In the picture beside is the result of lobster testing that was raised to the surface, machine vision algorithms are able to recognize the lobster virtually. The order from the lobster position with the smallest size to super quality each size is 12.09,12.90,13.56 and 16.08. The calculation of the grading is made in cm size.

Table 3
Testing of data sampling for lobster grading by random

Image Input	Description
	In the picture above is a randomized system testing of lobsters at the bottom of the pool, the system will be tested to read lobster grading randomly and real-time, each lobster size data will be stored in the database and can be used in real-time.
	In the picture, aside from the random results of testing machine vision techniques on lobsters found in ponds, the system calculates in real-time and virtual conditions and is not affected by lobster movements. on the computer, the lobster will be exchanged with a ‘cm’ measurement unit taken at the end of the lobster's head to the tail.

Table 4
Testing of lobster grading sample data collection and quality classification

Grading process	Description
	In the picture beside the lobster found at the bottom of the pool or tank, the computer will do the grading process automatically without lifting the lobsters from the bottom of the tank until the lobster habitat is not disturbed
	In the picture beside is the lobster classification process with color segmentation techniques by processing lobster visual appearance with image processing techniques. the method used is by using the thresholds method this function is used to distinguish lobster objects from the surroundings
	In the picture beside the machine vision technique, giving a marking with green on the area around the lobster automatically displays a result of grading '[Lobter Super]' which means that the lobster has entered the export quality lobster category.

Conclusion

From the results of the experiment above the implementation of a grading system on lobster with machine vision technology can be applied, the measurement and grading system carried out by computerized systems has a very high accuracy value. the system is able to measure the number and size of lobsters in many conditions, each measurement data will be stored in the database, another advantage of this machine system is that lobster development will not be disturbed because measurements performed visually without removing the lobster

can cause lobster to become damaged and deformed reduce selling points. The fishermen will easily classify lobsters ready for sale. while those who have not yet entered the lobster category, export quality can be returned to the tank or the tank for reproduction (English et al., 2020; Acheson & Gardner, 2010). Suggestion for further research is because whether or not a grading system depends on the visual appearance of the camera, it requires a camera and other sensor support system, other factors that influence lobster growth are water conditions so that it needs the addition of a PH sensor and the addition of a thermal camera it is known, the addition of a new algorithm will require Machine Vision to be able to recognize lobster types and varieties so that the output displayed is even more complete (Shobha & Rangaswamy, 2018; Blum & Langley, 1997).

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