Informative and Deep Learning System to Help and Save Stray Animals

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***Abstract*— Nowadays, stray animals have become a common thing around the world and its population is rising non stop every year. Stray animals could actually bring problems to the people for example public health issues, socioeconomic, traffic accidents and many others. In order to solve such problems, people have to take actions on saving and helping the stray animals out there. Therefore, a proposed system on creating mobile applications not only to save and help the stray animals but also spread the awareness and sharing information of the stray animals. Qualitative research and data collection methods are applied in this study and target users will be focusing on the pet owner and animal welfare organisations. Both snowball sampling and stratified sampling will also be applied in this study. For future recommendation of the proposed system, it would be creating a mobile application that provides information of stray animals, save and help them.**

Keywords*— Stray animals, YOLO, mobile application, information

I. INTRODUCTION

Stray animals are defined as animals such as cats and dogs that do not have an owner or were abandoned by human beings. Some of them usually wander around the streets independently searching for food or shelter, but there are some of them who usually hide at dim places suffering from starvation, and who knows they might die a few days later. According to the ASPCA organisation, there are approximately 3 million stray dogs and 3 million stray cats entering the shelters every year (ASPCA, 2019). Until now, it is really difficult to count the exact population of the stray animals as they are able to reproduce uncontrollably. Many researches have been carried on deep learning system (Long et al., 2022, Yuen et al., 2021). With such huge amounts of stray animals outside the streets without any surveillance, they can possibly bring nuisance and public health issues to anyone (Abdulkarim, Aklilu & Azam, 2021). In 2019, there was a public health disease detected and found from the stray dogs in Klang Valley, Malaysia. It was actually a tick-borne pathogen called Coxiella Burnetii, known as Q fever, a zoonotic disease. Anyone who is diagnosed with such diseases will have a lot of sweats and feel fatigue (CDC, 2019). As mentioned early, it could bring nuisance like overpopulation of the stray animals as they can breed unconditionally. Without birth control towards the stray animals, dogs and cats are able to breed up to 100 puppies and kittens in a year (Abdulkarim, Aklilu & Azam, 2021).

Nowadays, mobile devices have completely become one of the important things on a daily basis, either for communication or other purposes and so on. Any related information can be easily found in the mobile device; hence, it is suggested to implement a mobile application that could possibly give all the information that are regarding the stray animals as an awareness to everyone. Such information is able to assist people who do not have the knowledge to handle, take care and face stray animals as well as reducing stray animals' problem (Ioannidou, Papavasileiou & Poimenidis, 2022).

II. LITERATURE REVIEW

A. YOLO-Based Deep learning System

You Only Look Once (YOLO) is an algorithm that is able to identify and recognise objects in a picture that is in real time that is usually used in security, traffic, wildlife, etc. There are some useful advantages in the YOLO, which are the speed, high accuracy and learning capabilities (Karimi, 2021). The speed that the YOLO has is the speed of detection on certain objects especially in real-time. Not only the speed but also the high accuracy where it gives accurate results with least error to be appeared. It also possesses good learning capabilities that allow it to learn objects and apply it in object detection, the more it practises learning, the more effective it becomes (Karimi, 2021).

The deep learning YOLO algorithm is used to detect the stray animals through photos and image recognition (Rung-Chin, Qiao-En & Chung-Yen, 2020). Not many people use the YOLO in detecting objects of a photo and image as it really needs to work on the system by giving the system to make predictions about the bounding boxes so that it can detect and identify the object perfectly in each of the images. By implementing such features in the application, users are able to capture the image of the stray animals and automatically categorise the image into which category of stray animals it belongs to (Rung-Chin, Qiao-En & Chung-Yen, 2020). There are few samples that can be seen that the animals are bound by the YOLO system accurately.

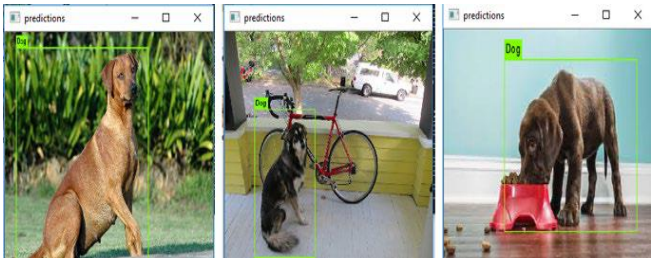

Fig. 1. YOLO-Based Deep learning System (Rung-Chin, Qiao-En & Chung-Yen, 2020)

B. Mobile Application

Users nowadays expect their mobile phones to perform almost identically to desktop computer systems. The growing grasp of mobile networks, the increased capability of mobile devices, and the potential for exponentially faster information communication are all converging to produce a robust system of mobile applications and markets. The ecosystem in which consumers are ready to accept today's mobility-enabled reality and all that it guarantees to have. They are taking the time to represent modern life's essentials: water, food, and smartphones. However, because of the complex methodologies of mobile application development, it is more difficult than the desktop computer system. as it needs to consider the operating system, processing power, memory, compatibility, and so on (Pujari, Patil & Sutar, 2020).

In mobile applications, there are certain things that need to be taken note of by the developers, which are the user interface, target user selection, security, etc. The budget, costs and resources that are needed to implement certain applications are very crucial in creating mobile applications. According to the research, before creating mobile applications, strategy and plan must be planned ahead and all resources have to be efficient and analyse well, same goes to the target user selection (Pujari, Patil & Sutar, 2020). Without planning ahead but losing its way when creating an application will definitely be a tragedy of it. User requirements are very important as well, so that developers understand the needs and to satisfy the target user.

C. Reliable Data and Information

Before the development of electronic devices such as computers and mobile devices, people tended to gather information and enforce design on it. After the existence of the electronic devices, it has ease a lot of work on gathering the data and information. However, not every data and information are reliable and accurate. As with the internet, many people tend to misuse and alter the data and information and turn it into false data and information. The example of the false data and information will be like scam, fake news, misused information, etc. Therefore, people should always be aware and stay cautious when looking for certain information especially in browning websites and filtering the information. By coming up with a solution to such a problem, the proposed system will be only providing reliable and accurate information from a legit website.

D. Similar System

WagWag

In this similar mobile application called Wagwag that was created in Germany, its goals is to save animals' lives, sterilization service and provide free legal help on animals that was created in Germany. From the application itself, we can see that it works like a forum that is able to sort and filter all desired data to be shown to the user. All users could post anything regarding pets or even stray animals as well in specific categories. However, the language is only in Deutsch where it limits users to change the language of the application. Fig 2 shows Wagwag application.

Hayvankara

The second similar mobile application called Hayvankara, was created by a student club to fulfil the needs of the animals living on the university campus and near the area. From the application itself, users are able to share any information of the animal's type, gender, image as well as description of the animal. Once the information has been created, it will automatically be in a google map of the university campus. Fig 3. shows Hayvankara application

Fig. 2. Wagwag application

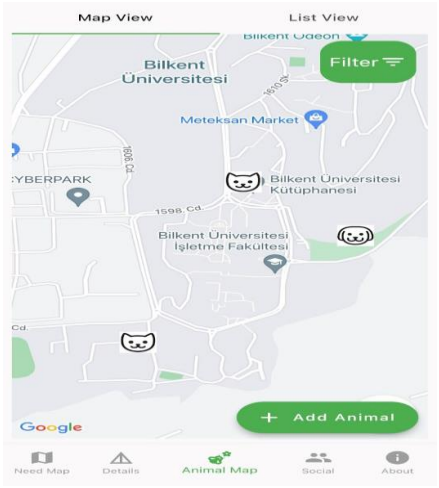

Fig. 3. Hayvankara application

E. Comparison

According to the Table I, the Wagwag application does not provide map location for users to identify the location of the cats or dogs but the Hayvankara application does provide map location for the user. Unfortunately, both do have relevant information about their application, their goals and so on but the language they have is limited whereby it is unable to change the language of the system.

These two systems have their own goals and purpose on helping and saving the stray animals, however, it is not effective, especially the language and the information they have currently. Therefore, the proposed feature from the table will be implemented into the proposed system.

TABLE I. COMPARISON BETWEEN WAGWAG AND HAYVANKARA

Features	WagWag	Hayvankara
Map		/
Deep Learning		
Relevant Information	/	/
Language		

III. Problem Statement

In the current situation, we could not estimate the population of stray animals in the world, as they breed fast and more in a year but are never taken care of by people. According to the research from Abdulkarim, Aklilu and Azam, the more stray animals there are, the higher the chance the spread of the zoonotic disease will be (Abdulkarim, Aklilu & Azam, 2021). The reason why the stray animals could carry such diseases is because they were not being vaccinated and taken care of properly (Feiyang, 2020). Therefore, stray animals must be saved immediately in order to prevent such diseases from happening one day.

Moreover, the knowledge of stray animals from people who do not own pets, it is crucial where what and how would they do if they come across stray animals. According to the study from Ioannidou, Papavasileiou and Poimenidis, most primary schools student have the acknowledgement of the stray animals and understand their needs as well, but the students are lack of the information about the problems that could bring from the stray animals such as overpopulation and public health issues (Ioannidou, Papavasileiou & Poimenidis, 2022).

However, there are issues about detecting the stray animals in the street, as they run and hide in just a second where naked eye has less time to catch up with the movement. For example, certain circumstances could make it harder to see and clarify, especially the effect of the background situation like weather (Yi-Cheng, Ting-Hsueh & Yeong-Lin, 2021).

IV. Research Aims and Objectives

The main aim of this research is to save and help the stray animals.

V. Research Objectives

- To implement a mobile application to be able to save stray animals.
- To spread awareness about stray animals with relevant and accurate information.
- To be detect the stray animals from the image.

VI. Research Questions

- How can the awareness, information and knowledge of stray animals be able to influence the user?
- How to ensure the location's effectiveness and accuracy of the stray animals?
- How to get the relevant organisation such as NGOs and SPCA organisation's attention?

VII. Research Significance

The findings and the importance of the research is to save and help all the stray animals that suffered outside without food, water and shelter. They are also living things that live on this planet earth and they deserve a better environment, not just wandering around the streets and worrying about death. By saving and helping all the stray animals, we will analyse necessary resources and plan well in order to take actions on them. It is not only sharing the location of the stray animals out there, but also voice out and seek help from relevant organisations such as NGOs, animal welfare organisations and other volunteers to help take actions on saving stray animals. Moreover, relevant and reliable information will also be shared through the application to spread awareness and knowledge of the stray animals out there, hence, people will understand which actions should be taken when they approach the stray animals. Last but not least, actions must be taken immediately to help and save the stray animals in order to give them a new life, prevent zoonotic diseases and overpopulation of the stray animals, thus, a mobile application is needed for solving such problems.

VIII. Methodology

In this research, qualitative research is needed to study in-depth about the population of stray animals and the awareness and acknowledgement of the people. The target respondents for this study will be the pet owner and animal welfare organisations. Sampling method that will be going to use is the stratified sampling and snowball sampling.

The stratified sampling is to divide the user into different subgroups where it is easier to differentiate the user's details. After dividing the groups, few groups will only be chosen for the study. The other sampling will be the snowball sampling where it is very useful in qualitative research. Only few respondents will be asked on the study and also to have more other related respondents that are relevant in the study. For example, contact a few respondents from the animal welfare organisations and ask them whether they have other people that they could bring in that is also related in the study.

Not only sampling methods, but also include the data collection method in the paper which are the survey. Survey is usually the efficient way to collect useful data from a huge different group of respondents. Google forms as one of the survey tools has been very convenient to the study by collecting data and later to be analysed into useful information.

IX. Overview of the Proposed System

Figure 4 shows the flowchart diagram, basically the flow of the mobile application process when the user uses the application. According to the flowchart diagram, users are forced to login their account at first in order to get identified by admins and users as well. However, users could also register an account along with name, email, contact number, address and so on. Only an account can be created by a user that is linked with the contact number, to avoid fraud identification happening in the application. Once logged into the main page, the user is able to submit a report by filling in a few details in the report form. Only the report is fully filled, then the process can proceed and users may submit the report to be viewed by others, else users unable to submit the report.

There are also other features in the proposed system such as information of the stray animals, other user's reports, organisation that is associated, etc. Moreover, new features that can be found in the proposed system are the map location and the YOLO. Proposed system will be showing a global map location near the user themselves and able to see other reports near them. Other than that, YOLO will be implemented in order to capture and identify the image of stray animals easily.

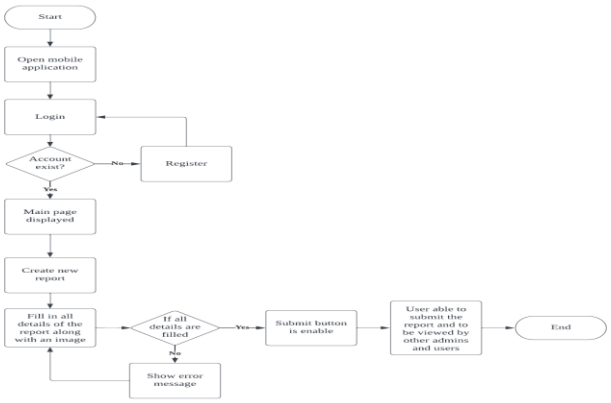

Fig. 4. Flowchart Diagram of the proposed system

X. CONCLUSION

By implementing the YOLO and giving out relevant and reliable information, it is to save and help the stray cats and to reduce the population of the stray animals to prevent certain problems that could happen to the environment and people. There are a lot of stray animals trying to survive day by day, hence, the proposed system with YOLO and information given should be implemented to save and help the stray animals, giving them a new home.

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