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Peenamu.lk - A Swimming Web Portal for Sri Lanka with Advanced Water Quality Monitoring System

Poornima L Perera
Hebei University of Technology
China
poornimalankani@gmail.com

Induwara Rupasinghe
General Sir John Kotelawala Defence University
Sri Lanka
induwararupasinghe123@gmail.com

Ashen Wanniarachchi
General Sir John Kotelawala Defence University
Sri Lanka
ashenw@kdu.ac.lk

***Abstract*— Swimming is a world-popular physical activity that integrates arm and leg actions with natural flotation of the body. This is an excellent stress reliever because it releases endorphins, which give a sense of well-being and happiness. In Sri Lanka, the majority of the people are doing swimming as a sport, and some are willing to do this as a hobby. Most people don't know how to swim, where they can learn swimming and how to find a certified coach. The objective of this research paper is to identify the problems that occur when swimmers finding certified coaches, the nearest pool and maintain the water quality of the swimming pool. This research was conducted using both qualitative and quantitative data. This mainly focuses on the survey that was conducted to the swimmers via a google form using social media platforms and identified the problems that the responders faced. And interviewed some of the leading swimming coaches in Sri Lanka to get their experience and qualifications and also interviewed pool managers to know how the maintain process of water quality of the pool. To overcome these issues, this research paper proposed a web-based swimming portal with advanced water quality Monitoring system for Sri Lankans who are doing swimming. This includes the previous techniques used for the web portals and the main strategies that can be added to the swimming portal. In the future, this portal can be implemented for diving, lifesaving, surfing, synchronized swimming, underwater diving, and water polo.**

Keywords*—Swimming, Water quality, certified coach, web-based

I. INTRODUCTION

One of the most well-liked leisure activities worldwide is swimming. In many nations, swimming is also a form of exercise. Additionally, compared to other sports, swimming injuries are somewhat less common. Swimming is an essential part of any training regimen, according to health and fitness experts. Swimming is a wonderful workout for all the muscles and helps the body's blood circulation. It is a type of low-impact aerobic exercise that boosts cardiovascular and muscular strength. In addition to being a full-body workout, it is a fantastic way to unwind and regenerate. Many people swim frequently to manage their weight and enhance their body shapes. In fact, swimming is regarded as one of the best ways to reduce stress.
In recreational and competitive swimming, the body is propelled through the water using a combination of arm and leg actions as well as its inherent buoyancy. Swimming is a well-liked all-around body builder that is especially beneficial in treatment and as exercise for people with physical disabilities. Additionally, it is taught to prevent death. See also diving, lifesaving, surfing, synchronized swimming, underwater diving, and water polo for further swimming-related activities.

In Sri Lanka swimming is an upcoming sport now. Most of the children engaging with swimming when they are small. The main issue when starting swimming to find out the nearest pool and qualified coach with experience. Most of the talented swimmers will not achieve well because lack of training due to training under unqualified coach. According to this problem to overcome these issues to proposed system "peenamu.lk" swimming portal to find out people a qualified coach with performance and qualifications, swimming class schedule, nearest pool and moreover the swimming equipment under a one platform. Additionally, from this portal pool manager can be able to monitor the water quality of the pool rather than using the manual method. When the people access the peenamu.lk can fulfill all their requirements that mention above under one platform.

To overcome the challenges and barriers, this research paper suggests a useful web platform for swimmers and those wishing to begin swimming. The following goals will be possible due to this website.

- Utilize previous research papers to identify the issues, solutions, tools, and distinctive qualities.
- Utilize a survey and an interview to learn the opinions of the people and find a solution to the issue.

Following are the research questions of the study.

Q1. What are the key components that identified from the past research papers?
Q2. How does the swimming portal will be usable for the swimmers?
Q3. How to maintain the water quality in accurate manner by the pool manager?

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II. LITERATURE REVIEW

According to the (Xiao Jiang, Shaobo Ji, 2014) researchers, they published an E-government web portal adoption as a service level and service quality perspective. The information quality of a web portal is used to operationalize service quality, dependability, functionality, security, and privacy protection features, as well as the quickness of the web portal. For the swimming portal these methodologies can use to give a best service for the swimmers.

(Bozidar Lj.Radenkovic, Marijana S. Despotovic Zrakic, et al.,2011) This research is about a web portal for adaptive E-learning. This study introduced an adaptive method that allows e-learning courses to adjust to students' prior knowledge and learning preferences. This website provides students with quick access to a variety of useful information. Students and teachers can share information for common class activities, and information and student services open channels of communication among community users. They also give faculties and universities a tool to innovate teaching, as well as a tool for students to engage in alternative forms of learning. According to this portal in swimming portal can be add some new features like this.

A. Nearest place finding system.

(M.A.P. Chamikara, Y.P.R.D. Yapa, et al.,2013) This research is about an efficient algorithm to detect the nearest location of a map for a given theme. This paper offers an algorithm for locating the nearest police station to a given location. The suggested approach successfully combines GIS, GPS, and J48 categorization. For this swimming portal this can be added to find the nearest pool and it will be very easy for the user.

B. Google map API

(Muhammad Sholeh, Naniek Widyastuti, Meireza Pratama,2017) This study focused on the google map for implementation of geographic information system development search location SMEs. The designed system has unique features including searching for information on handicraft centers, searching for centers' locations, and searching for centers' locations on maps. This application was created to make it easier for website visitors to locate tourist attractions within a range of 20 km. The sample of tourism-related items used in this study is found in Yogyakarta. the thoroughness of the tourism data. Information is determined by the item. Calculating the position of longitudinal and latitude allows one to locate a tourist attraction's closest location. The database's query system is used during the search process.

(Michal Konarski, Wojciech Zabierowski, 2010) This research paper is about using a google maps API along with technology.NET. This is building web applications in.NET technology based on the Google Maps service is not a challenging procedure, as stated in the paper. It essentially concerns the exchange of data between JavaScript and.NET, and this may be done quickly and easily by using a Webservice, where data serialization is handled automatically.

C. Advanced Water Quality Monitoring System

In recent study (Apriandy Angdreseya, Lanny Sitanayah,2020) of the Monitoring and Predicting Water Quality in Swimming Pools that included a wireless technology that used the Internet of Things to track and forecast water quality in public pools. The ESP8266 ESP-01 Wi-Fi module, an Arduino Uno, a DS18B20 temperature sensor, a PH sensor, and a turbidity sensor were all components of this system. This used the Iterative Dichotomises 3 Decision Tree approach to forecast the water quality. And this system comprised of a single sensor node that collected data from a swimming pool on a regular basis and wirelessly transferred it to the web server to be further analysed. The information can then be accessed by a person using a web browser. This feature can be added to the proposed system to check the water quality of the pool by using IoT.

(Varsha Lakshmikantha, Anjitha Hiriyannagowda, et al,2020) The research published about the IoT based smart water quality monitoring system that suggested an affordable and effective IoT-based smart water quality monitoring system that continuously monitored the quality parameters. Three water samples were used to evaluate the constructed model, and the cloud server received the parameters for further processing. This can be added to proposed peenamu.lk by using each IoT device to each pool and it's used by the pool manager. All these details of the water level and the water quality will display in this web portal.

D. Booking System

(Vaithegi, Sowmini, et al.,2020) The study focused on the swimming pool booking system. The administrator has access to the registrations and can modify the website's slots and availability. This website introduced new services to consumers, informed them about new products, shared information about future events, and more. It was created using HTML, CSS, JAVAScriptT (scripting languages), and MySQL. This is a responsive webpage that works on both computer and mobile platforms. To check the availability of slots and make reservations, utilize this page. The location of the pool and other information are available on this website.
(Daniyah Alkhaldi, Hajer Aldossary, et al.,2018) This research is about developing and implementing web based online university reservation system. The Unified Modeling Language (UML), MySQL, and the visual basic (VB) programming language were all used in the design and implementation of the proposed work. The suggested method addressed the excessive utilization of university assets, including stadiums, swimming pools, theaters, and halls where the IAU and reservation facilities are offered for community use as part of the university's involvement in community services, but at no cost to the institution.

E. Ratings

Researchers (Shangguang Wang, Zibin Zheng, et al.) have proposed a method for preventing malicious feedback rating prevention that makes use of Bloom filtering to improve the effectiveness of recommendations. Using a common Bloom filter, they found the offending feedback ratings' IP addresses and used them to locate and block them from passing through a web filter. The suggested reputation measuring method makes use of malicious feedback rating identification and feedback similarity computation to assess the reputation of web services. And also, for the swimming portal, it can be adding some rating system for the swimmers to rate their experience regarding the coach and swimming pool to identify new users before selecting a coach and a pool who using this web application.

F. Chatbots

The research (Eslam Amer, Ahmed Hazem, Omar Farouk, et al.,2021) is a proposed chatbot for Covid-19. It uses the pre-trained Google BERT language model to tackle the popular role of question answering. The first stage is a text classification strategy that uses the BERT Transformer to classify text input based on the meaning of the words themselves. The second stage is to apply the BERT model as well as the queried domain for answers. These methodologies that can be applicable to the swimming portal and for the chatbot, swimmers will be able to ask some questions that they have and the chatbot will be give suitable answers for them.

(Naing Naing Khin, Khin Mar Soe, 2020) This research is about a question-answering-based university chatbot using sequence to sequence model. This paper investigated neural network chatbot communication methods using the Sequence-to-Sequence model with an Attention Mechanism based on the RNN encoder-decoder model. The chatbot is designed to answer frequently asked questions about the institution and its relevant information in the higher education industry and it was a Myanmar Language chatbot. This trained the conversation model on both CPU and GPU, and it was implemented in Python. This paper proposed Natural Language Processing, sequence-to-sequence model, and attention mechanism as some methodologies. These methods are applicable to the swimming portal, and chatbot applications are quite beneficial for enhancing the user interface.

III. Methodology

This study used both primary and secondary data, with the primary source being a questionnaire intended for those who are currently swimming or who are interested in swimming. The distribution of this survey among a specified sample was used to determine the issues people in Sri Lanka face when trying to find a qualified swimming coach, swimming classes, and the closest swimming pool. Results were obtained through statistical analysis of the responses and the sample, which included 63 persons overall who are participating in swimming. As a primary source, interviews were conducted in addition to the questionnaire. Conducted interviews with some of Sri Lanka's top head swimming coaches, including Ruwan Manawadu, Julian Booling, Manoj Abesinghe, Shehaan Dias, and some other coaches as well. And also interviewed some of the pool managers to get an idea about how the pool water quality has been measured. This research used some published research studies as a secondary source. The problem that peoples are having getting a swim instructor was initially recognized in this study. The scope of the research was then discussed and determined, along with its applicability, with the help of the supervisor. In the third step, research was carried out utilizing studies that are linked to the study. These studies were analyzed, the most appropriate ones were chosen, and the best ideas were drawn from them. Create a questionnaire for those who are currently swimming and those who are interested in swimming, then compile the results. The survey results were then statistically analyzed. The final step is to synthesize the findings and offer a definitive response to the issue based on the findings. Figure 1 displays the stages that were taken during the methodology's execution.

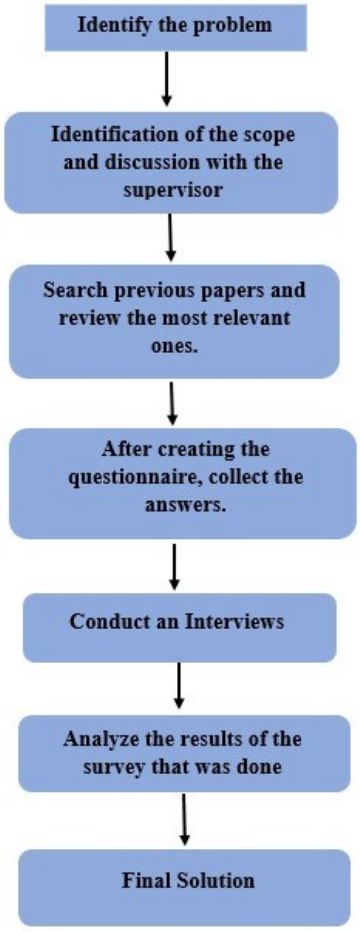
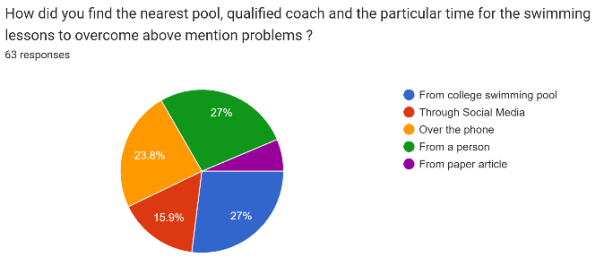


Fig. 1. Process of conducting the methodology

IV. ANALYSIS



The primary data received from the survey is the focus of the analysis section. This survey received 63 responses from those who were currently doing swimming or interested in starting, and it was investigated using a statistical method. Google Form was used for this survey and used WhatsApp and messenger as social platforms.

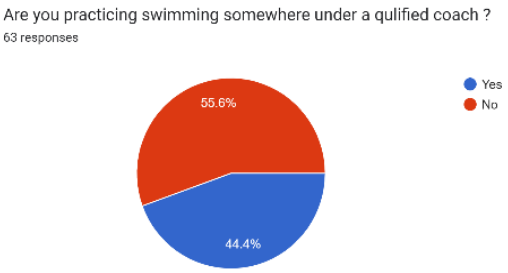


Fig. 2. Responses about the ones who practicing under a qualified coach.

According to figure 2, it's indicating about the responders that had practiced under a qualified coach. As a percentage 55.6% were not practiced under a qualified coach and 44.4% were practiced under a qualified coach.

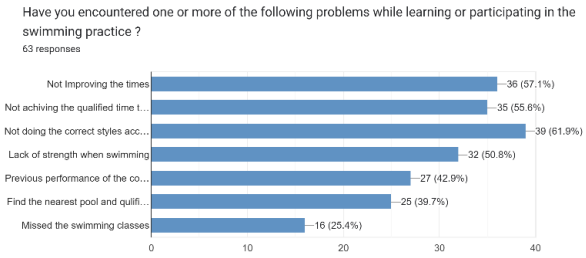


Fig. 3. Responses about the problems that got when learning or practicing swimming.

According to the figure 3, it shows the problems that occur when learning or practicing the swimming as a sport. Most of the responders didn't do the correct style according to the four strokes and as a percentage of 61.9%. As a percentage of 57.1% didn't able to improve their times, 55.6% rate of responders didn't achieve the qualified time that should enter the meet, rate of 50.8% had lack of strength when swimming, 42.9% rate of responders didn't know about the past performance of the coach, 39.7% as a percentage couldn't find the nearest pool and a qualified coach and 25.4% had missed the swimming classes.

Fig. 4. Responses about the findings of nearest pool, qualified coach, and particular time for the swimming lessons

Figure 4 shows how the responders found the nearest pool, qualified coach, and the time for the swimming lessons. Most responders found the nearest pool, qualified coach, and the particular time for the swimming lessons through college swimming pool and it's the rate of 27%. As a percentage of 27% found through a person, 23.8% found through the phone, person, 15.9% found through social media and 6.3% found through the paper article.

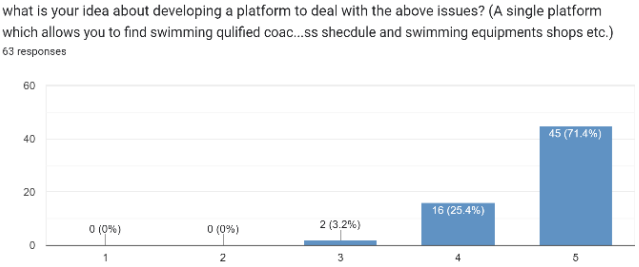


Fig. 5. Responses about the ones who like to develop a platform.

As the 4th question, it used the linear scale to get the responses from the responders. This scale used 1-5 options that 1 show that they didn't like and 4 shows that they would like to have a platform to overcome their problems. As a percentage of 71.4% would like to develop a platform which allows to find swimming qualified coach, nearest pool and classes schedule and swimming equipment shops. A rate of 25.4% would sleet the number of 4 and they would like to develop a platform. 3.2% selected 3, which they would mutually like to develop a swimming platform. Figure 6. Responses about the ones who like to use the web and mobile application.

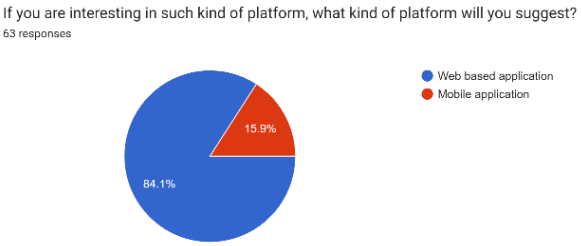


Fig. 6. Responses about the ones who like to use the web and mobile application.

Figure 6 shows the responses of the ones who liked to use web or mobile based application when developing a platform. Majority of responders were liked to use a web-based application and it was 84.1%. Others were selected a mobile application and it was 15.9%.

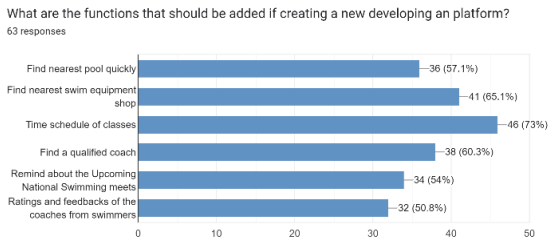


Fig. 7. Responses about what to add when developing a platform.

This above figure shows the functions that could be added to the developing platform. Most of the responders suggested about the time schedule of classes of swimming and it was 73%. As a percentage of 65.1% were suggested to add a nearest swim equipment shop, 60.1% were suggested to find a qualified coach, 57.1% would like to have an option to find the nearest pool quickly, 54% would like to have a reminder about the upcoming National Swimming Meets and 40.8% would like to have a rating and feedback of the coaches.
As another primary data, had an interview with the leading swimming coaches in Sri Lanka. These are the questionnaires that asked.

01. How swimmers contact you for your swimming classes?
02. How many swimming lessons per week?
03. How you deliver the swimming class details to swimmer who are interested in your swimming classes?
04. How you collect swimming class fees from them? Online method or manually?
05. How do you market yourself as a coach to swimmers to join with you to train under you?

According to this interview they had mentioned about the various answers, and it was really helped for this research.
Moreover, had an interview with the pool managers of swimming pools and following questions are asked from the pool managers.
01. How you check the water quality of the pool?
02. What are the steps that you're taking to maintain the good water quality of the pool?

V. RESULTS AND DISCUSSION

According to the survey that conducted for the swimmers there were 35 responders out of 63 that didn't practice under a qualify coach. 38 responders had the problem with the four styles and that they didn't doing the correct way. 17 were found the nearest pool, qualified coach, and the time for the swimming lessons through the college swimming pool. And 46 were wanted to develop a platform to overcome these issues and 53 responders would like to have a web-based application for this. 46 were mentioned to add the time schedule of swimming classes as a function to this application. And some of them suggest adding all the charges of the coaches, must be a reliable source, add coaches' performance and a lot of availability for swimming.

According to the interview, most of the coaches mentioned that the students were contact them through their contact number. And they mentioned three days of swimming lessons for the learn to swim swimmers per week and for competitive swimmers have six days of training. And they mentioned they were giving a personal card to the ones who would like to learn swimming and some of them have social media pages according to the swimming academy and they have given the details about the social media account. Through the social media page, the swimmer can see the details of the coach. They don't have a website for swimming academy. They mentioned they have collected fees by using both manually and online methods. But most of the time they were using the manual method.

According to the interviews that conducted with the pool managers, they have mentioned that they were checked the pool water quality through the manual method that shown on the following figure 8.

Fig. 8. Equipment used to check the water quality.

Considering the above survey results and interviews, it's essential to develop a web-based portal for the swimmers to overcome their problems also the water quality measuring system by using IoT for pool managers. The earlier methods and systems that are currently in use have been mentioned in past research papers. Additionally, during discussions with my supervisor, it was revealed that this system utilizes IoT technology and is intended to establish a connection through Bluetooth with the mobile devices of pool managers. This IoT system incorporates a suite of sensors including a Turbidity Sensor, a Liquid Suspended Particles Detection Kit (MD0591), a pH Sensor with a probe spanning the range of 0-14 pH (MD0415), and a DS18B20 Waterproof Digital Temperature Sensor Probe with a 1m cable (MD0094). Figures 9 and 10 illustrate the operational principles of this IoT system.

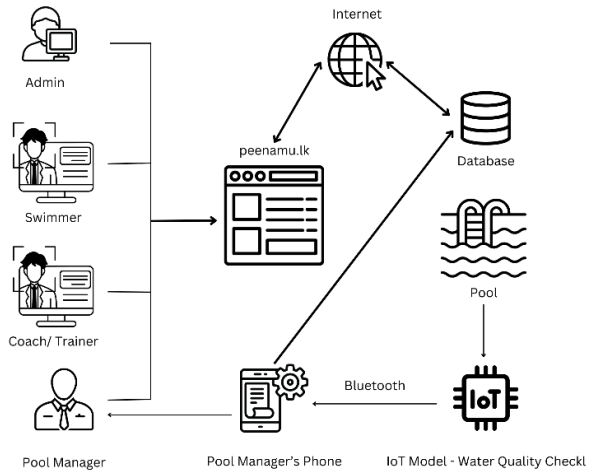


Fig. 9. How it's going to be work on the pool managers' mobile using Bluetooth.

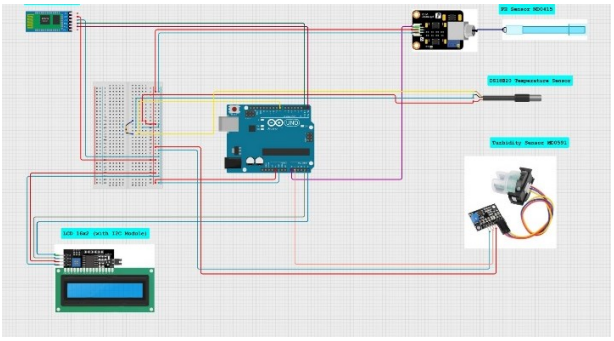


Fig. 10. The structure of the IoT

VI. Future works

Future work on this study will focus on developing this proposed system to not only for swimming but also other aquatic sports as well. Such as diving, lifesaving, surfing, synchronized swimming, underwater diving, and water polo. "peenamu.lk" will develop to add above mention aquatic sports as well. So, from this web portal people can do all the aquatic sports related work under a one roof. More than that this web portal hope to develop by the help of Sri Lanka Aquatic Sports Union to automate the swimming meet events entry forms of swimmers. Normally swimmers enter their events as manual forms and submit it to Sri Lanka Aquatic Sports Union and payments doing by manually. As a future work of this study can automated the swimming meet events entry form.

VII. Conclusion

Swimming is a popular sport for both recreational and competitive purposes. This is an individual or team racing sport in which one must go through water using their full body. The sport is played in either pools or open water. Swimming is an excellent all-around activity since it both raises your heart rate and relieves your body of some of the impact stress. This has numerous advantages and applications in life, making it an important life skill that everyone should acquire as a youngster or as an adult. In Sri Lanka, this is a very popular sport and nowadays all are learning without any age gap, but they are facing some problems such as hard to find a qualified coach with experience, hard to find the nearest pool, and a lack of strength. This research paper indicated a swimming portal called "peenamu.lk" to overcome these issues. The proposed system helps Sri Lankans to find the nearest pool, qualified swimming coach, find swimming equipment shops under one platform. The above-mentioned past research identified the available systems, and techniques that have usable for swimmers. Then examined the data gathered from the interviews that did with the Sri Lankan leading swimming coaches and pool managers. By considering the survey that was conducted among the ones who did swimming. According to the results from the survey and the interviews, suggested this would be a web-based swimming portal and from this, it will be very easy for the swimmers to find what they want in one platform anywhere and anytime.

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