

Development of Global Fishing Application to Build Big Data on Fish Resources

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어자원 빅데이터 구축을 위한 글로벌 낚시 앱 개발

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Abstract Despite rapidly increasing demand for fishing, there is a lack of studies and information related to fishing, and there is a limit to obtaining the data on the global distribution of fish resources. Since the existing method of investigating fish resource distribution is designed to collect the fish resource information by visiting the investigation area using a throwing net, it is almost impossible to collect nation-wide data, such as streams, rivers, and seas. In addition, the existing method of measuring the length of fish used a tape measure, but in this study, a FishingTAG's smart measure was developed. When recording a picture using a FishingTAG's smart measure, the length of the fish and the environmental data when the fish was caught are automatically collected, and there is no need to carry a tape measure, so the user's convenience can be increased. With the development of a global fishing application using a FishingTAG's smart measure, first, it is possible to collect fish resource samples in a wide area around the world continuously on a real time basis. Second, it is possible to reduce the enormous cost for collecting fish resource data and to monitor the distribution and expansion of the alien fish species disturbing the ecosystem. Third, by visualizing global fish resource information through the Google Maps, users can obtain the information on fish resources according to their location. Since it provides the fish resource data collected on a real time basis, it is expected to of great help to various studies and the establishment of policies.

Key Words : FishingTAG, Big Data, Distribution of Fish Resources, Global Fishing Application, Create Ecosystem

요 약 낚시의 수요가 급증하고 있는 반면에 낚시 관련 연구와 정보가 부족한 실정이며 전 세계적인 어자원 분포에 대한 데이터 확보에 한계가 있다. 기존의 어자원 분포 연구 자료의 조사방법은 조사지역에 방문하여 투망 등을 이용하여 어자원 정보를 수집하므로 국토의 소류지, 강, 바다 등 전역에 걸친 데이터 수집은 거의 불가능하다. 또한 기존의 물고기의 길이를 측정하는 방법은 줄자를 사용하였으나 본 연구에서는 피싱태그 스마트 줄자를 개발하였다. 피싱태그 스마트 줄자와 함께 사진을 기록하면 물고기의 길이, 물고기를 잡았던 환경데이터가 자동으로 데이터 수집이 되며, 줄자를 따로 가지고 다닐 필요가 없기 때문에 사용자의 편의성을 높일 수 있다. 피싱태그를 이용한 글로벌 낚시 앱 개발을 통해 첫째, 전 세계의 넓은 영역의 어자원 표본 수집이 실시간, 지속적으로 가능하다. 둘째, 어자원 데이터 수집에 대한 막대한 비용을 절감할 수 있으며 생태교란 외래어종의 분포 및 확장을 감시할 수 있다. 셋째, 전 세계적인 어자원 정보를 구글 맵을 통해 시각화하여 나타냄으로써 사용자는 위치에 따른 어자원에 대한 정보를 얻을 수 있다. 실시간으로 수집된 어자원 관련 데이터를 제공함으로써 인해 다양한 연구와 정책수립에 많은 도움이 될 것이라 기대한다.

주제어 : 피싱태그, 빅데이터, 어자원 분포, 글로벌 낚시 앱, 생태계 조성

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1. Introduction

Fishing is a popular leisure activity worldwide, forming a wide range of markets not only in Korea but also in advanced countries such as the United States, France, and Japan. With increased leisure time of the people and the popularity of TV programs such as urban men, children, teenagers, and women's interest in fishing is increasing[1]. Recreational fishing is a representative maritime leisure activity of people and plays an important role not only in stimulating the local economy but also in industrial aspects[2,3]. While the demand for fishing is rapidly increasing, fishery-related information is insufficient, and the collection of data on the global population distribution of fish species is limited[4,5]. Currently, part of the research effort is done by estimating catches through surveys, which makes the reliability of the results low. In 2020, a pilot project was conducted in collaboration with the National Bureau of Statistics to collect quantitative data on fisheries, such as the number of fishers, catches by fish species, and the number of monthly catches[6].

The government promotes data transactions through companies such as Data Stores, Data Vouchers, Big Data Platforms and MyData, but currently there is a lack of high-quality data on fish resources. Regulations on laws and systems such as data quality, pricing issues, and personal data protection are cited as barriers to reviving transactions[7]. As for the need to develop a fishery-related application, First, the existing method for studying the distribution of fish resources has limited ability to secure data on the distribution of fish resources by visiting the study area and recording the number of fish resources by manually casting a net into the water body. Second, since there is no obligation for anglers to report the yield, there is a lack of systematic collection principles for the data produced by individual anglers, indicating that

there is a limit to the collection of fish resource data[6]. Third, it is almost impossible to collect data throughout the country, including marsh, river, and sea. Fourth, the current survey method requires large budget and personnel for continuous global surveys. Therefore, this study was intended to develop a global fishing application using a FishingTAG to expand the fishing industry market and at the same time collect global fish resource data continuously on a real time basis.

With the application development, First, it is possible to reduce the enormous cost for collecting fish resource data by overcoming the limitations of the existing fish resource distribution sampling, which allows global sampling. Second, by visualizing and displaying the information of fish resource collected through the collective intelligence on the Google Maps, users can obtain the information on the fish resource according to their location. Third, the existing method of measuring the length of fish used a tape measure, but in this study, a FishingTAG's smart measure was developed. When recording a picture using a FishingTAG's smart measure, the length of the fish and the environmental data when the fish was caught are automatically collected, and there is no need to carry a tape measure, so the user's convenience can be increased. Fourth, continuous sampling is possible on a real time basis and monitoring the distribution and expansion of alien fish species disturbing ecosystem is possible, so it can contribute to the creation of an ecosystem[8]. Since the application developed provides fish resource data collected on a real time basis, it is expected to be of great help to various studies and establishment of policies at the same time.

2. Conventional Researches

2.1 Survey Method on the Distribution of Fish Resources

The research method to obtain the general data on fish resources is to first plan the area for the study. From the tip of Gyeongancheon stream to Paldang Lake Hapsu-ul, we select a specific area[9,10], and the specific survey area consists of latitude, longitude, minutes, seconds, coordinates, and maps[11,12]. In addition, the data on fish resources are obtained by specifying the temporal and content areas. The method of collecting fish varies according to freshwater and saltwater, different survey methods such as cast nets and marine survey vessels are used depending on the type of water body and fish species. The collected data on fish resources may vary depending on the time and method of survey, cannot be studied accurately due to the changes in the ecosystem, and accurate data collection is impossible. In addition, the collected fish are measured with a tape measure and photographed. The collected data are recorded and then the fish are released or if the fish species could not be identified, they are brought to the research center to find out the species of the fish. It is necessary to record and digitize the data of the collected fish species.

This requires a large budget and manpower for research. The National Institute of Fisheries Science[13], which has the most data to monitor the marine environment, has conducted a survey in 207 areas in domestic waters every two months since 1961. Since collecting Big Data with ships and boats is limited, data on various marine ecosystems are currently monitored with technologies that collect marine information via angleries information systems, IoT, and drones. When technologies such as Big Data, AI, and IoT become prevalent in the future, it will be important to create information systems and collected data about fish in real time and build an international marine knowledge base so that everyone can access it[14]. Among the various types of data that can be obtained from freshwater and oceans, non-living data are

collected in the fields of chemistry, physics, and geology. Data on non-living data are partially established, but for biological data, it is difficult to unify the collection and analysis methods, so the data management method is still in its infancy. Especially for marine fish, more comprehensive data management is needed, but there are currently no unified management guidelines due to the wide variety of species, such as fish size and different fishing methods[15].

2.2 Fish Resources Related Application

Recent domestic research on fishery-related applications has shown that the number and different variations of these applications are published. Compared to the demand for such a popular recreational activity, fishing, the number of fishing-related applications is small. Typical fishing-related applications are "Fishing App A" and "Fishing App B". First of all, "Fishing App A" allows you to check the weather for today and the next day based on your current location with domestic weather information (date, weather, temperature, wind speed, gusts, precipitation, humidity, and air pressure) related to sea fishing. It also displays a map based on the current location and highlights the surrounding fishing areas. When you select a fishing spot, you will get detailed information about the location of the fishing spot. It is not possible to collect data about the distribution of fish stocks because various information such as the type, length, and time of catch is not available, and this information is only provided domestically.

"Fishing App B" uses the open API of Korea Water Resources Corporation to provide information on weather, water level, and water quality at dam and weir locations. "Fishing App B" provides fishing logs and weather information(date, water, water temperature, wind speed, air pressure, humidity) that automatically stores the current location, weather, and water,

and provides nautical charts(depth), satellite maps, and wind maps that are useful for determining suitable fishing locations. Similar to "Fishing App A", it is not possible to collect data on the distribution of fish resources because it does not provide various information such as the type, length, and time of fish species caught and only provides information from inland in Korea. Therefore, this study aims to design and develop an application that can collect various types of data on the distribution of fish resources in areas such as traction areas, rivers, and seas not only in Korea but also worldwide.

3. Experiments and Result Analysis

3.1 Application Design using FishingTAG

Since the previous method of research on fish resource distribution collects information on fish resources by visiting the survey area and using a fishing net, it is almost impossible to collect data on the whole country, such as marshes, rivers, and the sea. There is a need for a new solution for the ever-changing sample survey of fish resources and the use of Big Data. The application development was based on Amazon Linux AMI 2018.03 server and Falcon Framework 3.3.2 (PHP) framework. The PHP version is 5.6.40, and the database uses PostgreSQL 9.6.22. The Android application was developed using Android Studio(Java), and the Swift 5.0 programming language was used to develop the application for the iPhone. For the development of the application, the weather information was developed using an open-source API. To develop this application, the process shown in Fig. 1 was followed. In order to provide not only domestic but also foreign services, the application was configured to allow signing up for membership using a Google account or a Facebook account.

After users sign up as a member, the user must agree to the Terms and Conditions for Use of

Personal Information and the Site-Based Services Agreement. Then users enter their name, e-mail address, and nationality. After entering his data, the user selects his interests. Check the location, weather information, time, and date when the fish that users want to fish are often caught. Tapping on Interest will users to the menu screen of the website. In each menu, users can access different information by selecting Zone Battle, Tournament, Events, World Record, Fishing Spot, Tides and Weather. Users can measure using FishingTAG's smart measures. The smart measure is placed under the fish within the specifications. Then, when users adjust the crosshairs so that the camera is level, the photo shutter is automatically unlocked and activated so that the user can take pictures.

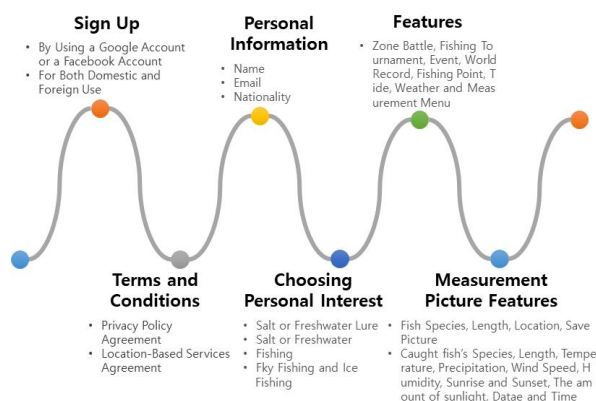


Fig. 1. Application Scenario

When users take a picture, information such as fish species, length, location information, weather information, time, and date are stored in the cloud database. Not only domestic information but also foreign information is stored in the database, so the information is available in real-time when users go fishing abroad. Conversely, users who travel to Korea from abroad to fish can get real-time information on fish species caught by region, location, and time. In addition, users can also monitor the prevalence and spread of ecological disturbances caused by invasive species around the world.

Based on Big Data collected in real-time through the application, it is expected that there will be many demands in the future by automatically presenting users with predictive data on the probability of acquiring fish resources.

3.2 FishingTAG Development and its Smart Measure

FishingTAG's smart measure is a smart measurer necessary to measure the length of the catch from the application. The weight and length are listed in Table 1. It is lightweight and easy to carry, and as shown in Fig. 2, it consists of a vintage strap, so it can be attached to the bag or other location with Velcro behind the rubber tag.

Table 1. FishingTAG's Weight and Length

weight	10g
Dimension	150mm*30mm*4mm
App Connectivity	iPhone/iPad Android 5.0(Lollipop)

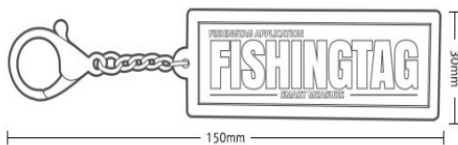


Fig. 2. FishingTAG's Smart Measure

In the previous method of measuring the length of fish, a tape measure was used. In this study, you can determine the length of fish by taking a photo with FishingTAG's smart measure.



Fig. 3. Method of Length Measurement

After fishing, record the image using FishingTAG's smart measure. As shown in Fig. 4, the length of the fish and the environmental data in which the fish was caught is automatically recorded, and the user's convenience is increased because he no longer needs to carry a tape measure.

As shown in Fig. 4, the length of the fish and the environmental data in which the fish was caught is automatically recorded, and the user's convenience is increased because he no longer needs to carry a tape measure.

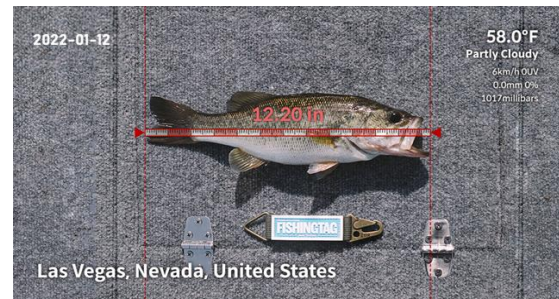


Fig. 4. Length Measurement using FishingTAG's

3.3 Application Implementation

The main screen of the developed app is shown in Fig. 5 and the main menu consists of Zone Battles, Tournaments, Events, World Records, Fishing Points, Tides, Weather, and Length Measurement.

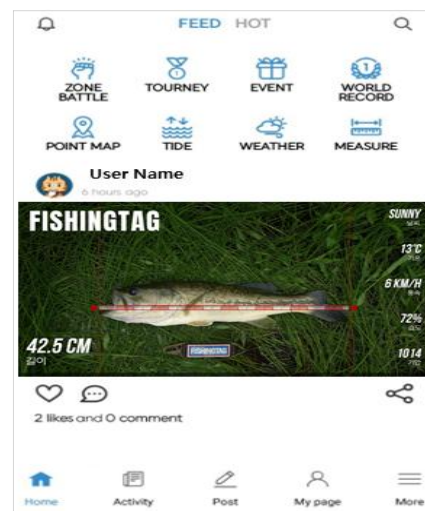


Fig. 5. Main Screen

The Zone Battles menu is a location-based fishing competition at famous fishing spots around the world to determine the best angler in a given zone area. For the fishing tournament menu, online fishing tournaments are held through collaborations and partnerships with various companies. In this way, fishing activities are operationalized and used to build Big Data on fish resources.

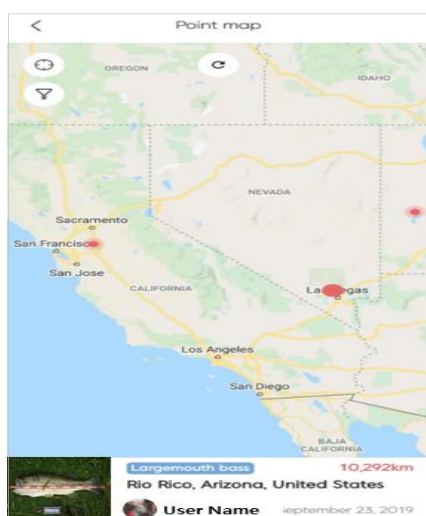


Fig. 6. Fishing point screen

The Fishing Points menu screen is shown in Fig. 6 and provides domestic freshwater and saltwater fishing points as well as global freshwater and saltwater fishing points based on Google Maps. It is a map where data is accumulated and updated in real-time based on the user's fishing data, and where the surrounding fishing points can also be found. When the user selects a fishing spot, a list of user-generated content is displayed. When the user selects one of the different lists, he/she can find out which fish species have been caught at the selected fishing point, and the fishing point's environmental data is displayed. The weather and tide menu allows the user to retrieve the weather and tide information for the next 7 days based on the current date. The user can change the date and location to retrieve the weather and tide information for specific areas, allowing the

user to determine the best time and region to catch the species of fish they need.

The detailed screen created by the users is shown in Fig. 7 below. When users adjust the placement area of FishingTAG's smart measure, align it, and take a photo of the tape measure by adjusting the fish's mouth and tail, the length of the fish is automatically measured.

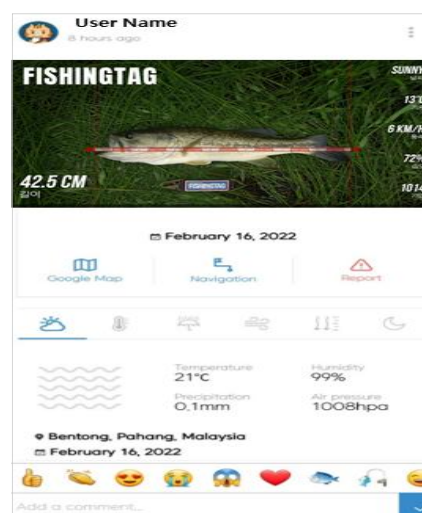


Fig. 7. Detail Screen

3.4 App Evaluation for the Global Fishing App Update

The Fishing Application was developed in 2019. It was uploaded to the app store so that users can download the app for free and learn about fishing. Then, the demand for fishing application was surveyed using a questionnaire. Based on the results, the app was updated and re-released in 2021 to enable the creation of Big Data on fishing resources. The number of respondents was 2,428, and a demand survey was conducted on 15 questions for anglers who used the app more than three times. In this paper, only a few points related to the need for updates are presented. Users think that information on fishing spot locations according to fish species is needed? The results are shown in Table 2. And 97.2% have said that they are necessary for fishing.

Table 2. Need information on fishing spot locations according to fish species?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Frequency	671	1,344	345	45	23
Percentage	27.64%	55.35%	14.21%	1.85%	0.95%

Was not it difficult to use the application, and was it easy to view the information? The results for the UI/UX aspect of the application are shown in Table 3. 84.02% of the respondents answered positively, and the data that were negative were investigated and reviewed. Those who commented negatively stated that the application was not configured to see all the information at a glance and that it was inconvenient to use the application because they had to move the screen frequently.

Table 3. Application's UI/UX ?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Frequency	255	735	1,050	298	90
Percentage	10.50%	30.27%	43.25%	12.27%	3.71%

Do you think overseas information about fisheries is also necessary? The results are presented in Table 4. Surprisingly, it was found that they are interested in information about overseas. 94.56% answered positively that they need it.

Table 4. Foreign fishery information needed?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Frequency	142	948	1,206	98	34
Percentage	5.85%	39.04%	49.67%	4.04%	1.40%

Is the information on the size, i.e., length, of the fish stocks caught necessary for fishing? The results for are shown in Table 5. 97.86% responded positively.

Table 5. Is the information on the size of fishes needed?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Frequency	770	1,128	478	34	18
Percentage	31.71%	46.46%	19.69%	1.40%	0.74%

Based on the survey, we updated the fishery data to make it more convenient for users to obtain various information. It has been implemented so that fish resource data can be created.

4. Conclusion

As more and more people take up fishing as a hobby, the market for the fishing industry is expanding. Despite rapidly increasing demand for fishing, there is a lack of studies and information related to fishing, and there is a limit to obtaining the data on the global distribution of fish resources. Currently, part of the research effort is done by estimating catches through surveys, which makes the reliability of the results low. The existing method of investigating fish resource distribution is designed to collect the fish resource information by visiting the investigation area using a throwing net, it is almost impossible to collect nation-wide data, such as streams, rivers, and seas. And, since there is no obligation for anglers to report the yield, there is a lack of systematic collection principles for the data produced by individual anglers, indicating that there is a limit to the collection of fish resource data.

If an application for fishing is developed due to the proliferation of smartphones and the development of communication technologies, various information can be provided to anglers through the application to obtain information about the popularity of fishing and information about fish resources. A recent survey of various fishing applications in Korea found that the

number of fishing applications is small compared to the demand for recreational fishing. Most applications display maps based on their current location and show nearby fishing spots. When selected, they provide detailed information about the location of the fishing spot. However, these applications do not provide various information such as species, length, and time, so data on fish resource distribution cannot be collected, and the information is only available in Korea. Therefore, this study designed and developed an application that collects various types of data on the distribution of fish resources not only in Korea but also around the world, including marshes, rivers, and oceans. In addition, the existing method of measuring the length of fish used a tape measure, but in this study, a FishingTAG's smart measure was developed. When recording a picture using a FishingTAG's smart measure, the length of the fish and the environmental data when the fish was caught are automatically collected, and there is no need to carry a tape measure, so the user's convenience can be increased.

With the development of a global fishing application using a FishingTAG's smart measure, First, it is possible to collect fish resource samples in a wide area around the world continuously on a real time basis. Second, it is possible to reduce the enormous cost for collecting fish resource data, and to monitor the distribution and expansion of the alien fish species disturbing ecosystem. Third, by expanding the fishing industry market and visualizing global fish resource information on the Google Maps, users can obtain various information on the fish resource according to location. Fourth, since it provides the data on the fish resources collected on a real time basis, it is expected to be of great help to various research and the establishment of policies related to fish resources. In the future, the author plans to provide customized services by conducting machine learning of AI based on

data collected on a real time basis through the developed application.

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