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Selective Advertisement Transmission System Design Using Smart Sensor

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Abstract

In this paper, we sought ways to accept and reject advertisements using the function of a smartphone gyro sensor to enable selective transmission and reception of YouTube advertisements by linking the gyro function of mobile phones. In the case of YouTube advertisements, the skip button is activated after the advertisement is played for a certain period of time (about 5 seconds) before and after the video is played. During the time the advertisement is maintained, it can be used to achieve various goals such as increased website traffic, brand awareness, and sales induction. Since this type of advertisement is not a setting in which the transition takes place immediately, it can be seen as the most suitable setting to strengthen brand awareness. However, due to the nature of the YouTube advertising system, it is often discarded through users' skipping behavior in the process of sharing and reproducing information. Therefore, in this paper, we implemented an optional advertisement transmission system that applies the principle of gyroscope to minimize wasted advertisements and selectively maintain desired advertisements in consideration of the transmission and reception aspects of advertisement broadcasts. It measures rotational repulsive force with directional stability and car wash characteristics, and uses algorithms to identify the slope and angular speed of mobile phones to ensure that advertisements are transmitted and received. Through this, it is expected that advertisement transmission can be performed on the side of an advertisement provider, and selective advertisement reception can be performed on the side of a user.

Keyword: *Advertisement Transmission, Gyro-sensor, YouTube, Ad sense, Smart-sensor*

1. Introduction

Since the birth of YouTube 14 years ago, YouTube era opened not only in Korea but also to rest of the world. YouTube, the world's largest video platform, has more than 1.5 billion users due to its rapid growth, and information sharing and viewing by these 1.5 billion users are frequent. In particular, YouTube advertisements are broadcast before and after the video is played, or in the middle of the video, the skip button is activated after the advertisement is played for 5 seconds. It can be used to achieve various goals such as website traffic, brand awareness and reach, and increased sales induction. However, since it is not a setting where an immediate transition occurs, it can be seen as the most suitable setting for strengthening brand

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awareness. However, due to the nature of YouTube's advertising system, information sharing and viewing are often discarded through the skip process. For example, no matter how well-made advertisements are, they cannot deliver their messages properly because of the time limit of 5 seconds, and even commercial and emotionally bad advertisements or ridiculously long advertisements must be watched for 5 seconds. As a result, YouTube is criticized for poor advertisements, and users are incurring additional costs to block such information sharing itself through apps or premium services that block advertisements [1,2].

In this paper, research using gyro-sensor in smartphones, a common entertainment device for YouTube, and transmission algorithms was done in order to assure that advertisement aimed at variety of viewers actually benefits all participants. Data and result of this research offer an opportunity to rethink about the environment of advertisement transmission. Therefore, this paper is presenting an algorithm for public service advertisement to maximize public interest [3,4].

2. RELATED RESEARCH

2.1 YouTube

Since its launch in 2005 and acquisition by Google a year later, YouTube has grown from a repository of amateur videos into the biggest online video platform worldwide. As shown in Figure 1, according to recent YouTube statistics, the video sharing platform has 2.3 billion users worldwide as of 2021 (Startista, 2021). It was considered the second most popular social network, and Facebook is the only platform that has more users than YouTube. These 2.3 billion users are defined as viewers who log in to the site at least once a month. Considering that YouTube videos can be viewed without using Google accounts, such as WhatsApp's automatic playback function, YouTube actually has a higher reach. If the YouTube statistics shared for the first time did not receive attention, this statistics will naturally draw attention. 79% of Internet users said they had YouTube accounts. Every day, people watch 1 billion hours of videos on YouTube and generate billions of views (YouTube, 2019). Let's calculate. If everyone on Earth watches the video, it is about 8.4 minutes a day per person. It's an amazing number that can add to the reliability of video as a content source for people [10].

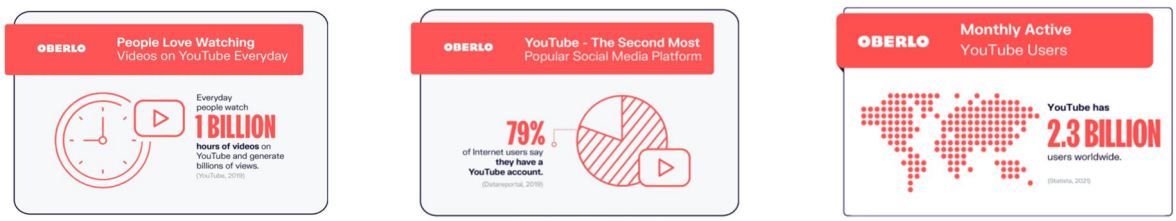

Figure 1. Statistics of YouTube

2.2 AdSense

Google AdSense is Google's advertising program that contrasts with AdWords for advertisers. Website owners can share advertising revenue with Google by signing up for AdSense. As for advertising revenue, advertising publishers pay Google for advertising by clicking AdSense ads, and Google shares the accumulated advertising costs with website creators. AdSense will feature advertisements that are most related to web pages among the advertising pools subscribed to Google, but if not, public service advertisements will be released. Public service advertisements do not generate profits even if the user clicks them [6]. As part of Google's revenue allocation business, it has the function of publishing advertisements and has 2 million users at this point. These advertisements are naturally linked to YouTube, which is affiliated with Google, and there are

various forms such as videos before watching YouTube videos and videos (AFC), including videos (AFV) and blogs, which are yellow-lined advertisements for YouTube video playback bars. The transmission method initially transmits all kinds of advertisements, then checks the user's search content, finds the closest advertisement in the category, and transmits advertisements that suit the user's taste, and the more accurate the data accumulates. A similar service called Google Fit is also in operation in Korea[7,8].

2.3 Gyro-Sensor

MEMS sensors are actually recognized as important building blocks for implementing various applications in the electronic device field. From game consoles, mobile phones, laptops and white home appliances, these electronic devices have already been using low-g accelerometers to implement motion-operated user interfaces and improved protection systems since recent years. This gyroscope, which can measure the angular ratio around one or more axes, complements the MEMS accelerometer perfectly. By combining these two types of sensors, accelerometers and gyroscopes, all movements in three-dimensional space can be tracked and captured. Thereby, system developers can achieve a more immersive user experience and accurate navigation system. The core of the gyroscope is a micro-machined mechanical element that operates according to the Tuning Fork method and is designed to convert the angular ratio into a displacement of a specific sensing structure using the Coriolis principle[9]

3. SMART SENSOR BASED TRANSMISSION SYSTEM

3.1 Gyro-Sensor approach

Gyro sensor used in this paper is a device that uses directional stability and precession characteristics of gyroscope and measures rotational resistance to convert into electrical signal, and can calculate angular speed through rotation per speed in z axis. Thereby, it can find the angle of drone or smartphone and MEMS sensor widely used in smartphones is a gyro-sensor method that uses Coriolis phenomenon to measure angular speed. The acceleration sensor applied in this paper measures the amount of force an object receives based on the Earth's gravitational acceleration.

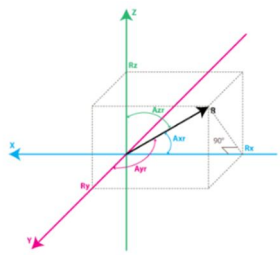

Figure 2. Principle of gyro sensor

As shown in the figure in Figure 2, the rotation angle that can be obtained with the rotation angle component and component for each axis can be seen. In other words, when the acceleration of gravity acting on the sensor is still, the magnitude is measured by dividing it by three vectors on the X, Y, and Z axes. It is resistant to errors over time. Since a specific value comes out even when the acceleration sensor value is stopped, it is often used to determine the degree of inclination or vibration. Gravity acceleration may be expressed as the sum of vectors of values X, Y, and Z measured by the acceleration sensor. The gravitational acceleration may

be expressed as the sum of vectors on the X, Y, and Z axes. The acceleration sensor measures these divided vector values. In summary, the size of each axis represents the gravitational acceleration by decomposing it into the X, Y, and Z axes. However, there is a disadvantage in that the rotation angle (direction angle) for the surface perpendicular to the ground cannot be measured. In order to measure the θ angle with the floor by tilting the 3-axis acceleration sensor around the x-axis, y and z vector values were tan applied. The value of θ can be easily obtained using Arctan. A sensor that detects an angular speed (how many times per second) of the gyro sensor. This is the principle of detecting angular velocity by using the physical phenomenon that Coriolis force works perpendicular to the direction of the velocity when an object with a certain speed rotates. The inertial force that occurs when an object moves in a rotational coordinate system, a force of magnitude proportional to mass and velocity in the direction of motion and perpendicular to the direction of motion. Coriolis force, called forwarding force, is the force that appears on a rotating object, and its intensity is proportional to the speed of the object, and the direction of the force acts perpendicular to the direction it moves. The rotation angle of the gyroscope sensor is obtained by integrating the rotation angle component.

3.2 Application of Gyro sensor

As Figure 3, on the left is the content of the source code. The gyro sensor-related code may be first input from the open source, and may be directly performed by manual operation. The input value is a code that responds to the rate of change in x, y, z-axis and acceleration. During execution, each conversion value according to the time change is finally stored. In this way, the state of each change value is continuously updated from the initial state.

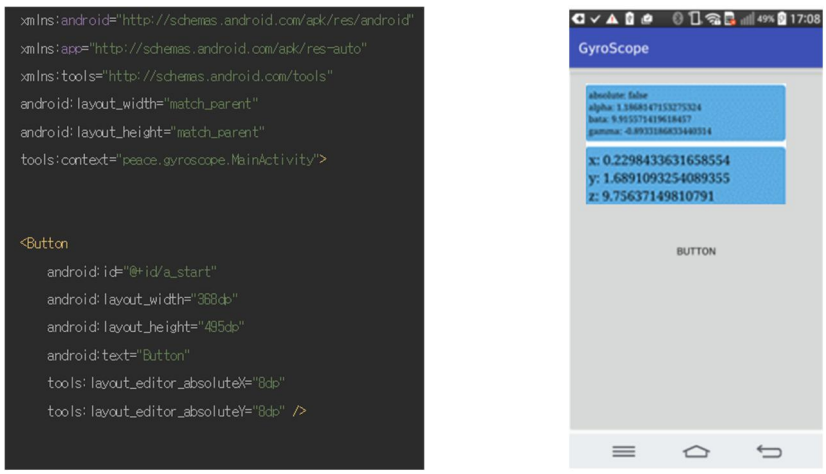

Figure 3. Gyro sensor code and display

However, the magnitude of the error may gradually accumulate from the error value of the data measured by the gyroscope. It may be confirmed that the error size may increase in some cases during the execution process. As shown in Figure 3, the gyroscope sensor operates with the button pressed. Outputs the rotation angle component XYZ value through the log. In addition, the rotation angle Roll, Pitch, and Yaw obtained through the output value of ZYZ were output. The x-axis and y-axis remain zero, but the code is based on the prepared phrase and long-running image when the z-axis rotates 9 to 10 times and the user clicks the assigned button. However, a relatively short version of the prepared video is turned on if each axis deviates from the presented rotation rate.

3.3 Advertisement Skip Button Test

Table 1 shows the results of the experiment. The data set used here includes time series data generated by accelerometers and gyroscope sensors (attitude, gravity, user acceleration, and rotational rate).It is collected as an iPhone 6s that stores in the participant's front pocket using a sensing kit that collects information from the core motion framework of an iOS device. All data are collected at a 50 Hz sampling rate. 33 participants, including gender, age, weight, and height, conducted six activities downstairs, upstairs, walking, jogging, sitting, and standing 15 times under the same environment and conditions, and the types of movement were divided into moving, sitting down, and jogging. Using this dataset, the goal was to find a pattern by attribute that can be used to infer the gender or personality of data targets in addition to personal attribute fingerprints, that is, activities, in the time series of sensor data. Table 1 shows an average value performed 15 times, and as the result of the measured action, as expected, the higher the concentration in the sitting down, the more often the skip operation is performed.

Table 1. A chart for each student to use YouTube's skip button for each situation

	Male(A)		Female	
Situation	M/H school student (a)	College student (b)	M/H school student (c)	College student(d)
Moving	9	7	9	8
Sitting down	10	10	10	10
Working	1	2	2	2

4. CONCLUSION AND FURTHER WORKS

In this paper, we used a gyroscope sensor that measures the rotational resistance of a gyroscope with directional stability and car wash characteristics to generate electric signals, calculate the rotational angular speed of the z-axis, and applied it to YouTube advertising broadcasts to analyze users' responses to advertisements. As shown in Table 1, the study was conducted on participants. Male students (A) and female students (B) form an upper cluster, and the upper cluster is divided into middle school, high school students (a), and college students (b). Comparing clusters A and B based on gender, both groups recorded high frequencies, but no significant significance was found. In addition, no significant pattern was found in the comparison of cluster a and cluster b. However, when analyzing each situation, the participants did not use the skip button at a significant level. According to data found in tests for skip buttons, people do not care about arbitrary advertising as long as there is audio and use skip unless something special happens.

We implemented an optional advertising transmission method that minimizes advertising waste and selectively maintains the desired advertisement by applying the gyroscope principle in consideration of the transmission and reception aspects of advertising broadcasting. It measures rotational repulsive force based on directional stability and car wash characteristics, and uses algorithms to identify the slope and angular speed of mobile phones so that advertisements can be transmitted and received. Through this, it is expected that

advertisements can be transmitted from the perspective of advertising providers, and selective advertisement reception from the user side will be possible.

Concluding from the experiment, in order to maximize the effect of advertisement by drawing attention, viewers likely to use skip button have to be shown visual public service advertisement that can appeal before 5 seconds which cannot be skipped. However, the experiment excluded the acceleration calculation function of the gyro sensor and fixed the measurement criteria for the x, y, and z axes to 0, 0, 9 assuming that the smartphone is not fixed to the stand or is at an angle. Criteria for the accurate distinction between 'moving' and 'hold' rather than the movement of livestock need to be developed through further research.

References

[1] Myung-Jae Lim, Young-Man Kwan, “Design of location information system using a IoT-based on sensor” 2018.1 Journal of Engineering and Applied Sciences 13/639-642.
DOI:https://doi.org/10.7236/IJASC.2021.10.3.66

[2] Myung-Jae Lim, Young-Man Kwan, “Water quality measurement system for Water Reuse using a PH sensor” 2018.2 Journal of Engineering and Applied Sciences.
DOI: https://doi.org/10.7236/IJASC.2021.10.3.66

[3] S. Han, Exploring Book-Related Contents on YouTube - Focus on Winter Library, International Journal of Advance Smart Convergence, Vol.9, No.2, pp. 84-89, 2020.
DOI: https://doi.org/10.7236/IJASC.2020.9.2.84

[4] Seonghoon Jang and Seung-Jung Shin, “Machine Learning-Based Programming Analysis Model Proposal: Based onUser Behavioral Analysis,” International Journal of Advanced Smart Convergence(IJASC), Vol.9, No.4, pp. 179-183, 2020. DOI: http://dx.doi.org/10.7236/IJASC.2020.9.4.179

[5] Soonduck Yoo, “Research on the Methodology for Policy Deriving to active Artificial Intelligence,” The Journal of The Institute of Internet, Broadcasting and Communication(JIIBC), Vol. 20, No. 5, pp.187-193, 2020.
DOI: https://doi.org/10.7236/JIIBC.2020.20.5.187

[6] Gui Yeol Ryu, “A Study on Open API of Securities and Investment Companies for Activating Big Data,” International Journal of Advanced Smart Convergence (IJASC), Vol. 8, No. 2, pp. 102-108, 2019.
DOI: http://dx.doi.org/10.7236/IJASC.2019.8.2.102

[7] Daishin Securities Co. https://www.daishin.com.

[8] eBest Investment & Securities Co. https://www.ebestsec.co.kr.

[9] https://pinkwink.kr/1108

[10] www.oberlo.com/blog/youtube-statistics \