Fuzzy Logic Based Decision Support System for Broadcaster on Twitch

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Abstract

Social media is at the forefront of the fields that science and technology are developing. The expansion of social media and internet bandwidth has enabled the emergence of a live broadcast platform. Twitch is one of the most important platforms that serves this area in particular.Especially in the playground, Twitch appeals to millions of users around the world.The large number of users using this platform, the need to analyze the data coming from these users, necessitated the application of artificial intelligence techniques.One of the most important of these artificial intelligence techniques is the Fuzzy Logic approach.In this paper, it is aimed to make an estimation of the audience size which can be addressed according to the characteristics of the users who broadcast on Twitch and those who consider broadcasting or studying with Fuzzy Logic.

Keywords: Fuzzy Logic, Decision Support System, Twitch

1. Introduction

The use of social media is becoming widespread in many places around the world. With the development of Internet connection technologies, social media content has begun to differ. Especially the increase in internet bandwidth is changing the behaviors of social media content producers. After the development of video-based social media content, live broadcast platforms are gaining importance. The content produced in live broadcasting platforms serves in many fields such as education, commercial, military and health. Since live broadcasting platforms have become increasingly widespread, analysis studies in this area have gained importance. In this study, the live broadcast platform Twitch was analyzed and a recommendation system was proposed to the content producers.

The statistics on Twitch, which is a live broadcasting platform, emerge as the area that needs to be done. According to the Twitch 2017 report, 355 billion minutes Twitch channels were followed, while more than 2 million unique monthly publishers were generated, while the winners of this platform increased by 223%. All figures show a growth of 25% in 2016 compared to 2016 and continue to operate in more than 60 countries around the world.

In recent years, live streaming platforms have been used for educational purposes through video. These processes are used as a practical and easily accessible method for non-professional trainers. The social benefits that Twitch brings out of the new communities and which people come to these environments have been emphasized (Hamilton et al., 2014).

Rapidly growing live streaming platforms continue to grow with viewers. The basic follow-up motivations of viewers have been the subject of research. In a study, it was concluded that topics such as social interaction, community sense, meeting new people, entertainment, information search and lack of external support in real life were aimed at monitoring Twitch (Hilvert et al., 2018).

In another study, the potential of live broadcasting technology and the features required to improve learning from instructors at different levels of expertise have been addressed. By selecting a game, the potentials in the in-game performance have been measured and the potentials of the channel, which live in certain conditions, have been addressed. In addition, the characteristics of the novices in the live broadcasting environment and the characteristics of the learning were determined. It has been studied that live broadcasting technology can improve learning and provide the most appropriate conditions for students to learn (Katherine et al., 2017).

In this study, a decision support system will be proposed to be popular with new content producers by taking advantage of the basic features of content producers in the Twitch platform. The data set of the study consists of the basic features of the live broadcast channels that produce content. Content manufacturers have a direct link to popular features. These links have an effect on the different levels of popularity of each feature. These complex connections require the use of the Fuzzy Logic approach in the study.

Logic basically started with Aristotle approach. In all cases, Aristotle used the concepts of True or False. This logic approach has been used for many years and is still used. However, it has been found that these rationales have shortcomings in terms of specifying needs. In the studies done, everything could not be expressed by binary logic such as "Exist", "None" or "True", "False". Thus, the fuzzy logic approach, in which uncertain ones can be expressed, has emerged (Timuçin et al., 2017).

The first Fuzzy Logic approach was announced in 1956 during a conference in the US. Lotfi A. Zadeh published the Fuzzy Logic approach with his article published in this conference (Zadeh, 1965). This approach, which is closer to the human thought system, produces more accurate results in identifying real situations. The human thought system is used fundamentally 0.2, 0.6. instead of certain expressions. Fuzzy Logic approach, in which the intermediate values have gained meaning, was found to be the most suitable method for this study.

2. Material and Method

In this study, Fuzzy Logic approach is used. The data set of the study was obtained using TwitchAPI. The data set of the study was collected by providing a TwitchAPI connection with the C # programming language. Collected data is in JSON format and C # language methods are used for normalization. The collected data were made meaningful to pass through the Fuzzy logic controller after the normalization process. The application was created using MATLAB. As the fuzzy inference method, the clarification method shown in Figure 1 was determined as Mamdani. The method used by Mamdani and called the mean of the maximum (MOM - mean of maximum) is a direct result of fuzzy cluster and membership function operations with fuzzy logic.

Figure 1. Basic Structure of Fuzzy Logic Controller

Blurring is defined as the process of converting the values that are the input information of the study to a human language language such as Slow, Normal, Fast. After the blur, a new set of values that are converted to this new language is delivered to the Decision Making Center. The Decision Making Center develops inferences similar to the implications of people against events and situations. The Decision Center establishes the rules and sets these rules. These stored rules are delivered to the Rinsing Unit. Rinse Converts the unit to values that can be detected by computer systems. The resulting output values are used to serve the final purpose of the study.
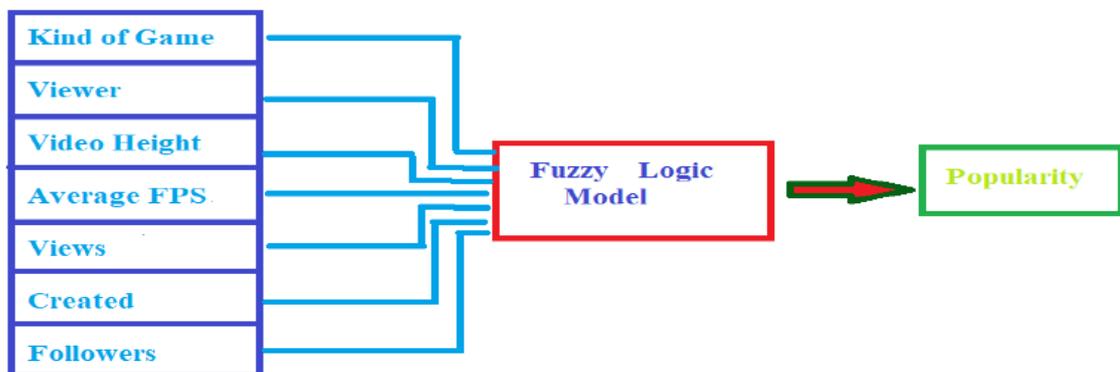

Figure 2. Fuzzy Logic Structure

Figure 2 shows the fuzzy logic structure, which is adapted to the input data and output data in this study. To determine the main characteristics of the live broadcasting platform channels, which are very watched and less watched. It is to provide a decision support system to the channel users who want to find the similarities in the data classes and want to be popular.

In the study, the type of the game played in the channel is PS KindofGame, the channel's instant view average "Viewer ight, the screen size of the channel ın VideoHeight", the average Frame Per Second (FPS) value of the channel AverageFPS ", the total number of views of the channel is Views, the channel's broadcast history "Created", the number of followers of the channel, "Followers ", has been determined according to the input data. When determining the characteristics of these data, a Member Degree was assigned for each parameter. It is used to determine the degree to which an input value belongs to a human language term with the help of this assigned Membership Degree.
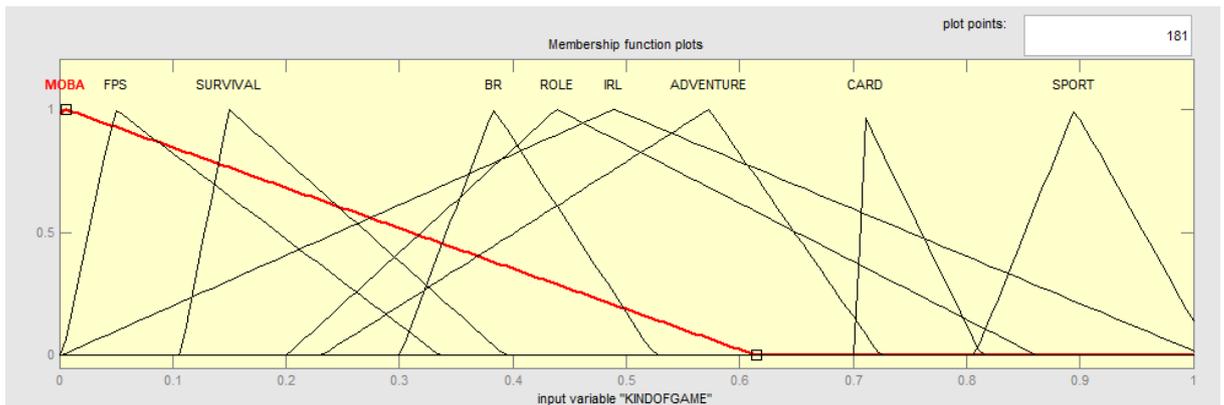

Figure 3. KindofGame Membership Function

For KindofGame 9 game types have been determined. These are FPS (First Person Shooter), Survival, MOBA (Multiplayer online battle area), BR (Battle Area), ROLE (Role Action), IRL (In Real Life), Adventure, Card, Sport.
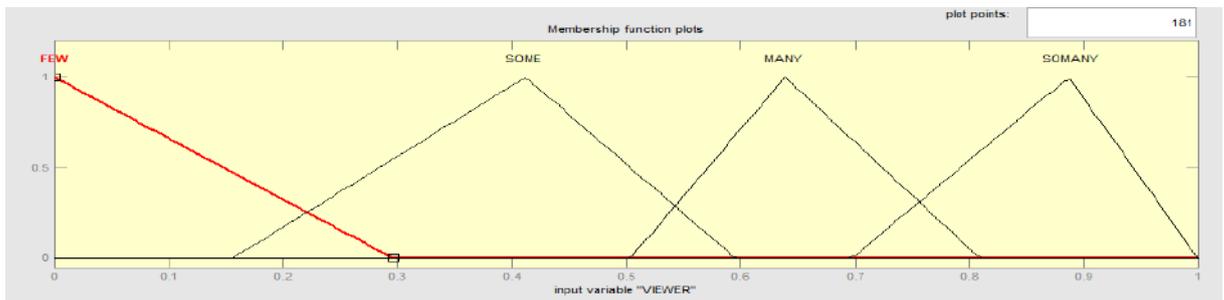

Figure 4. Viewer Membership Function

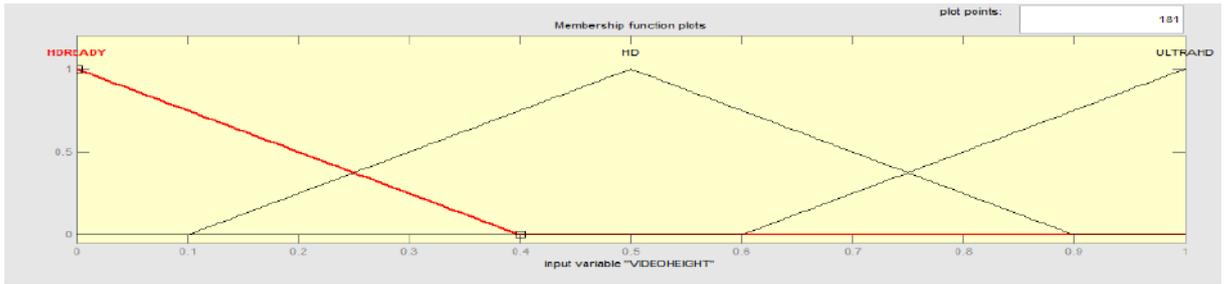The number of views has been assigned as Less, More, Too, Too Much.

Figure 5. VideoHeight Membership Function

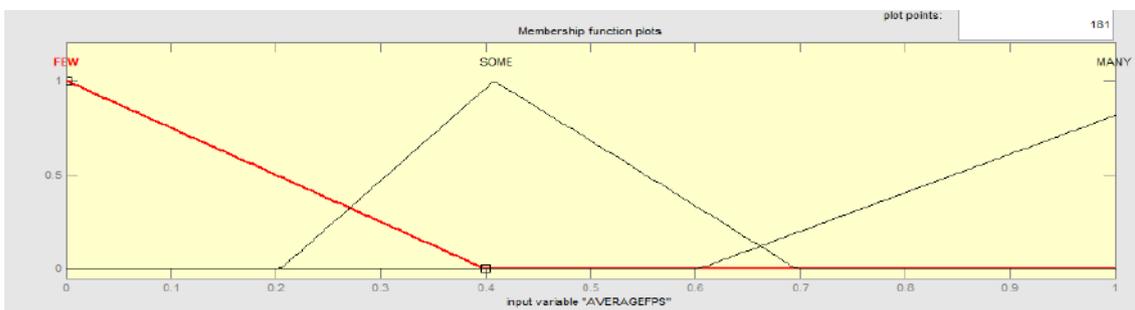Screen size membership ratings are set to HDReady, HD, and UltraHD.

Figure 6. AverageFPS Membership Function

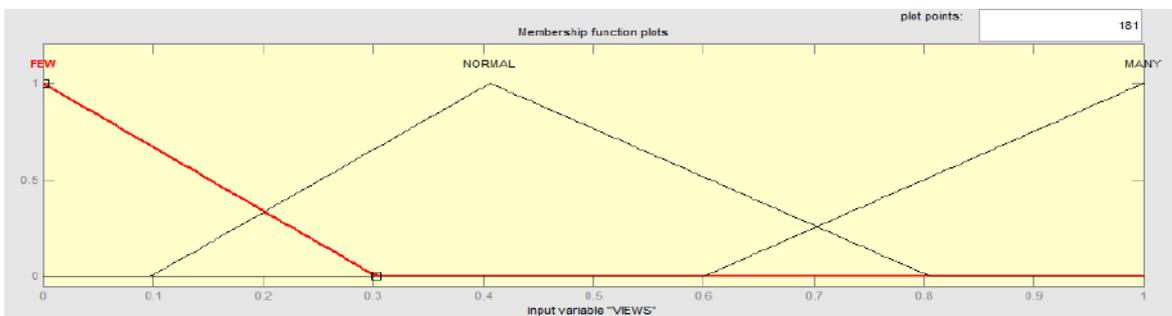Average FPS values were determined as low, medium and high.

Figure 7. Views Membership Function

If the number of views is in the data set, the membership ratings are set as Az, Normal, and Multi.
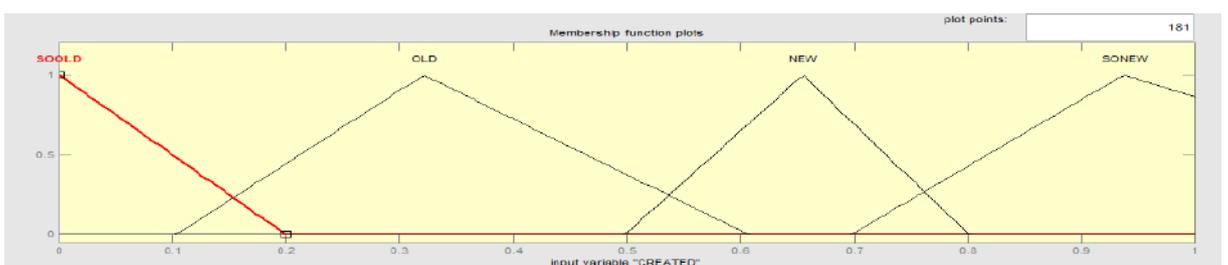

Figure 8. Created Membership Function

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Very old, old, new, very new membership levels are determined in the input information about the broadcast history.
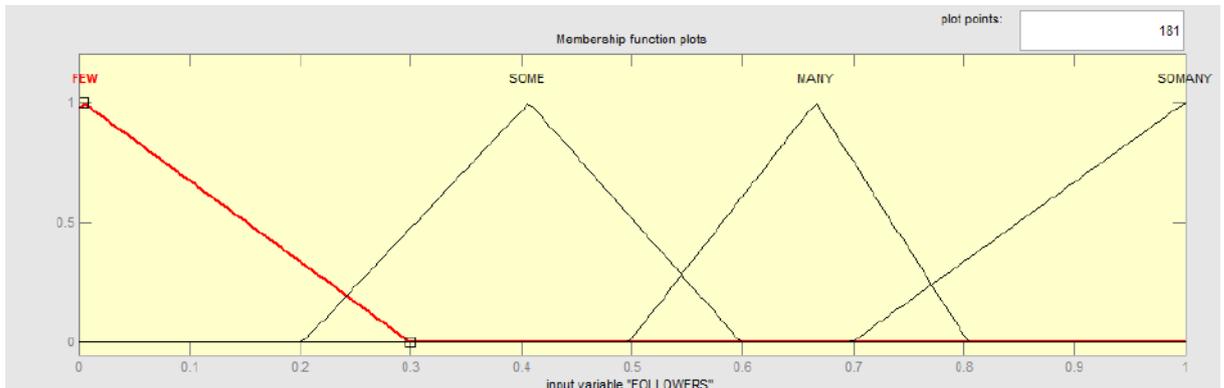

Figure 9. Followers Membership Function

In the input information about the tracker information, the membership degrees are set to Low, A little, Very, Very Over.

3. Results and Discussion

The data obtained by normalization process after data pre-processing will be transferred according to the determined label values. Instant viewing 0-100: Low, 100-500: Moderate, 500-5000: High, 5000+ Very High; Screen Quality 720p: HDReady, 900p: HD, 1080p: UltraHD; Average FPS: 0-30: Low, 30-60: Medium, 60+: High; Past Views: 0-1000000: Low, 1000000-10000000: Normal, 10000000+: High; Publishing History (Created): 2018,2017: Very new, 2016,2015: New, 2014,2013: Old, 2012,2011: Very old; Follower: 0-500: Low, 500-1000: Normal, 1000-100000: High, 100000+: Very.

Output classes are classified as popular, popular, and very popular. These input values have been passed through Fuzzy Controller. Then, it is aimed to obtain popularity class based on the rule table. The number of rules is calculated by multiplying all the input data determined as input. For optimum operation, this number of rules must be as low as possible and is expected to verify the result optimally. The total number of rules used in this study is 27. The results obtained by the Decision Making Unit according to the rules determined in the rule table are assigned to the Popularity output parameter after passing through the Rinse Unit. These values will be aimed at finding answers to the question about the status of being popular with the live broadcast content producer. The output parameters shown in Fig. 10 are

intended to determine the popularity level in the maintenance of features that the content generating channels have.

Table1. Rule Table

If (KINDOFGAME is FPS) and (VIEWER is FEW) and (VIDEOHEIGHT is ULTRAHD) and (AVERAGEFPS is MANY) and (VIEWS is SOME) and (CREATED is SOOLD) and (FOLLOWERS is FEW) then (POPULARITY is LITTLEPOPULARITY) (1)
If (KINDOFGAME is BR) and (VIEWER is SOMANY) and (VIDEOHEIGHT is ULTRAHD) and (AVERAGEFPS is FEW) and (VIEWS is FEW) and (CREATED is SONEW) and (FOLLOWERS is SOMANY) then (POPULARITY is LITTLEPOPULARITY) (1)
If (KINDOFGAME is BR) and (VIEWER is MANY) and (VIDEOHEIGHT is HD) and (AVERAGEFPS is SOME) and (VIEWS is MANY) and (CREATED is OLD) and (FOLLOWERS is MANY) then (POPULARITY is SOMEPOPULARITY) (1)
If (KINDOFGAME is IRL) and (VIEWER is FEW) and (VIDEOHEIGHT is ULTRAHD) and (AVERAGEFPS is FEW) and (VIEWS is FEW) and (CREATED is SOOLD) and (FOLLOWERS is SOMANY) then (POPULARITY is LITTLEPOPULARITY) (1)
If (KINDOFGAME is IRL) and (VIEWER is MANY) and (VIDEOHEIGHT is ULTRAHD) and (AVERAGEFPS is FEW) and (VIEWS is MANY) and (CREATED is SOOLD) and (FOLLOWERS is MANY) then (POPULARITY is SOMEPOPULARITY) (1)
If (KINDOFGAME is IRL) and (VIEWER is SOMANY) and (VIDEOHEIGHT is HD) and (AVERAGEFPS is FEW) and (VIEWS is MANY) and (CREATED is SOOLD) and (FOLLOWERS is SOMANY) then (POPULARITY is SOPOPULARITY) (1)
If (KINDOFGAME is MOBA) and (VIEWER is SOME) and (VIDEOHEIGHT is HDREADY) and (AVERAGEFPS is FEW) and (VIEWS is FEW) and (CREATED is SOOLD) and (FOLLOWERS is FEW) then (POPULARITY is LITTLEPOPULARITY) (1)
If (KINDOFGAME is MOBA) and (VIEWER is MANY) and (VIDEOHEIGHT is ULTRAHD) and (AVERAGEFPS is MANY) and (VIEWS is SOME) and (CREATED is SONEW) and (FOLLOWERS is FEW) then (POPULARITY is SOPOPULARITY) (1)
If (KINDOFGAME is MOBA) and (VIEWER is MANY) and (VIDEOHEIGHT is ULTRAHD) and (AVERAGEFPS is MANY) and (VIEWS is MANY) and (CREATED is SONEW) and (FOLLOWERS is FEW) then (POPULARITY is SOMEPOPULARITY) (1)
If (KINDOFGAME is SURVIVAL) and (VIEWER is MANY) and (VIDEOHEIGHT is HDREADY) and (AVERAGEFPS is MANY) and (VIEWS is SOME) and (CREATED is NEW) and (FOLLOWERS is FEW) then (POPULARITY is LITTLEPOPULARITY) (1)
If (KINDOFGAME is SURVIVAL) and (VIEWER is MANY) and (VIDEOHEIGHT is ULTRAHD) and (AVERAGEFPS is MANY) and (VIEWS is SOME) and (CREATED is NEW) and (FOLLOWERS is FEW) then (POPULARITY is SOPOPULARITY) (1)
If (KINDOFGAME is SURVIVAL) and (VIEWER is MANY) and (VIDEOHEIGHT is ULTRAHD) and (AVERAGEFPS is FEW) and (VIEWS is SOME) and (CREATED is NEW) and (FOLLOWERS is FEW) then (POPULARITY is SOMEPOPULARITY) (1)
If (KINDOFGAME is CARD) and (VIEWER is FEW) and (VIDEOHEIGHT is HDREADY) and (AVERAGEFPS is MANY) and (VIEWS is FEW) and (CREATED is SOOLD) and (FOLLOWERS is FEW) then (POPULARITY is LITTLEPOPULARITY) (1)
If (KINDOFGAME is CARD) and (VIEWER is FEW) and (VIDEOHEIGHT is HDREADY) and (AVERAGEFPS is MANY) and (VIEWS is SOME) and (CREATED is SOOLD) and (FOLLOWERS is SOMANY) then (POPULARITY is SOMEPOPULARITY) (1)
If (KINDOFGAME is SPORT) and (VIEWER is FEW) and (VIDEOHEIGHT is HDREADY) and (AVERAGEFPS is MANY) and (VIEWS is SOME) and (CREATED is SOOLD) and (FOLLOWERS is SOMANY) then (POPULARITY is LITTLEPOPULARITY) (1)
If (KINDOFGAME is SPORT) and (VIEWER is SOME) and (VIDEOHEIGHT is ULTRAHD) and (AVERAGEFPS is MANY) and (VIEWS is SOME) and (CREATED is SONEW) and (FOLLOWERS is SOMANY) then (POPULARITY is SOMEPOPULARITY) (1)
If (KINDOFGAME is ROLE) and (VIEWER is FEW) and (VIDEOHEIGHT is ULTRAHD) and (AVERAGEFPS is MANY) and (VIEWS is SOME) and (CREATED is SONEW) and (FOLLOWERS is FEW) then (POPULARITY is LITTLEPOPULARITY) (1)

Low Popular, Popular and Very Popular variables that belong to the output class mentioned here are the first listed content producer channels on the Twitch homepage. TwitchAPI connection is provided with C # programming language and data for hours of N = 7 are determined for all days of the week. These data were stored in the text file and kept on the local computer. These data were then prepared for MATLAB application development by pre-processing data.

After all the data were collected together, the technical specifications received for each live broadcast content channel were matched to the level of popularity. The specifications of the content generator channel are given in the table below. The data in the table are given together with the data format which was obtained first and the state of the data after preprocessing.

As an example, the first content in Table 1 is a game channel FPS type of game, 1080p worth of the screen to provide images, with an average of 90 FPS, 3000000 total monitoring, since 2012 and 450 followers, while the value of the popularity value was found to be 0.282. These values indicate that there is a less popular channel as measured by the rule table. Also shown in Table 1 is given by calculating the Popularity values of the other channels.

Table 2. Output Value Obtained According to Input Values

KindofGame	Viewer	VideoHeight	Average FPS	View	Created	Followers	Popularity
FPS	90 (FEW)	1080p (ULTRAHD)	90 (MANY)	3000000 (SOME)	2012 (SOOLD)	450 (FEW)	0.282 (LITTLEPOPULAR)
Sport	750 (SOME)	1080p (ULTRAHD)	80 (MANY)	4000000 (SOME)	2017 (SONEW)	150000 (SOMANY)	0.562 (SOMEPOPULAR)
MOBA	3000 (MANY)	1080p(ULTRAHD)	75 (MANY)	3500000 (SOME)	2018SONEW	320(FEW)	0.703 (SOPOPULAR)
IRL	6000 (SOMANY)	900p (HD)	30 (FEW)	12000000 (MANY)	2012 (SOOLD)	120000 (SOMANY)	0.834 (SOPUPLAR)
CARD	95 (FEW)	720p (HDREADY)	70 (MANY)	900000 (FEW)	2011 (SOOLD)	180 (FEW)	0.178(LITTLEPOPULAR)

In card games, followers and total viewing affect the popularity. This situation makes the interaction with the user very important. Screen quality in sports games and the introduction of the new publication required a positive advantage. In the Role games, instant follow-up and the number of followers are related to the popularity. In adventure games, the situation is slightly different. The history of viewing is quite high and the display quality is high. The MOBA is a new channel-type content generator, and a high FPS value is important. While each input value mentioned here is meaningful together, its effect on the result class is different. In this study, decision support system has been prepared for content producers who want to reach the masses by determining the basic features required to be popular in the live broadcasting platform. Thanks to this proposed system, it will take into account the need to have content to be popular with live broadcast channels or new content producers who have not yet entered the broadcast. The current system leads to a positive acceleration in the way of popularity by making the least monitored channels the main features as well. This study will produce more optimal results using more data sets. In order to improve the existing system, the content produced by the channels will also produce more optimum results by considering other features such as audio and video. A broader rule table will produce more usable and predictable results.

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