

# The Development of Android-Based Statistical Application for Taekwondo Match Analysis

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**Abstract** – Rapid advances in technology are of particular concern in the development of sports. Studies related to the application of technology in sports have begun to develop, especially in the sport of Taekwondo. This research aims to develop an Android-based statistical application that focuses on analyzing taekwondo matches. This is an research and development (R&D) project. Interviews were conducted to collect information needed for researchers and the needs of athletes and coaches in developing this application. Experiments and evaluations are needed to perfect the applications that have been created. The results of the study are statistical applications for analyzing attack techniques, defensive techniques, and game patterns. These applications were specifically designed for the Android platform. The main advantage of this application is its ability to increase efficiency and accuracy in match analysis, replacing manual methods that are prone to errors. By providing tools that can be accessed on a variety of mobile devices, the app hopes to bring positive change in the way coaches and athletes approach competition preparation.

**In conclusion**, it is hoped that the development of an Android-based statistical application can make a real contribution to the development of the sport of taekwondo by providing specific, efficient and responsive technological solutions.

**Keywords** – Android software, match statistics, taekwondo, sport science, research and development.

## 1. Introduction

The sport of taekwondo is a dynamic martial art and has developed into a global competition with an increasingly fierce level of competition [1]. In this context, analysis of taekwondo matches becomes essential to understand the athlete's attack patterns, weaknesses, and strengths [2]. Although technology has made a major contribution to various aspects of sports, there are not many applications that focus on statistical analysis of taekwondo matches [3]. Therefore, the development of an Android-based statistical application becomes relevant to meet the need for deeper analysis, bringing the sport of taekwondo into a new era of strategic understanding and development [4].

Taekwondo match analysis is not an easy task considering the high speed and dynamics of movements involved in each match [5]. Current manual analysis systems tend to be time-consuming and have a potential for human error [6]. Therefore, the need for efficient and accurate solutions is increasingly urgent [7]. Android-based statistics applications are considered a potential alternative, providing the flexibility and mobility needed to observe and record match data in real-time [8].

The Android platform offers easy accessibility, compatibility, and high functionality, making it an ideal choice for sports app development [9]. With the integration of Android technology, the statistics application can provide a solution that is faster, easier to use, and can be accessed on various mobile devices [10].

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The ability to obtain and analyze data directly from the competition field will make a significant contribution to improving athlete strategy and training [11].

Implementation of an Android based statistics application will bring increased efficiency and accuracy in data collection and analysis [12]. With interactive and responsive features, this application allows users to log data without interruption, while intelligent algorithms can provide more in-depth and accurate analysis [13]. This will help coaches and athletes gain better insight into their performance, allowing for more effective tactical and technical improvements [14].

This research has strong relevance, especially in facing increasingly high taekwondo competition. By understanding and analyzing matches more holistically, athletes and coaches can make better decisions, improve strategies, and optimize athlete potential [15]. The research aims to develop an Android-based statistical application for analysis of taekwondo matches. This is done not only by technological innovation, but also by analysis regarding the real contribution that can be made to the development of taekwondo.

## 2. Methodology

Research and development (R&D) methods are applied to develop statistical applications in Taekwondo sports. The stages of the R&D method are as follows:

- Stage 1: Identify Needs and Problems:
- Stage 2: Prototype Design:
- Stage 3: Application Development:
- Stage 4: Evaluation and Testing:
- Stage 5: Refining and Finalization:
- Stage 6: Implementation and Dissemination:
- Stage 7: Evaluation and Maintenance:

## 3. Results

The research project followed a 7-stage framework developed by the researchers. This framework guided the research and development process, leading to the following results.

### 3.1. Identify Needs and Problems

Identification of needs and problems begins with a review of literature and research related to the application of statistics to sports, especially taekwondo.

Interviews with coaches, athletes, and taekwondo experts are used to identify needs and obstacles in recording statistics. Analysis of the results of preliminary studies to identify the main needs of users and the features required include statistics to determine overall attack, defense, and game patterns.

It is hoped that the development of an Android-based taekwondo statistics application can help coaches and athletes analyzing taekwondo matches. This is important to do in an effort to make a significant contribution to the understanding, strategy and development of athletes and coaches.

### 3.2. Prototype Design

Prototype design is carried out by presenting the desired output design in a match report which contains various information needed for analysis of a taekwondo match (Figure 1). Implement an initial prototype based on the design that has been prepared and also involve potential users (athletes and coaches) in testing the prototype to obtain initial feedback.

*Figure 1. Match report*

### 3.3. Application Development

In the initial stages of application development, it is carried out based on the design and feedback from the prototype that has been implemented. The coding system implemented also ensures that the functionality of statistical recording and data analysis is well integrated. This functionality test is also needed to ensure all features work as expected and identify and fix any bugs that may arise.

```

class CounterForm extends StatefulWidget {
  final Fight fight;
  final Map<String, String> hitNames;

  const CounterForm({super.key, required this.fight, required this.hitNames});

  @override
  CounterFormState createState() {
    return CounterFormState();
  }
}

class CounterFormState extends State<CounterForm> {
  late int duration;
  late int countDown;
  late Timer timer;
  late List<Widget> lButtons;
  late List<Widget> rButtons;
  late List<Widget> infoTexts;
  late int currentTime;
  late bool isPlaying;
  late bool isFinish;
  late Icon buttonPlayIcon;

  @override
  void initState() {
    initButtons();
  }
}
    
```

Figure 2. Initial application development coding

### 3.4. Evaluation and Testing

Field trials involving taekwondo athletes and coaches in training or competition situations. User response to application use and identification becomes the focus for improvement. The big improvement that was made was adding right and left buttons to the layer so that you could easily differentiate between right and left foot kicks (Figure 3). Apart from that, the initial display which only used alphabet letter codes was also replaced by using kick names which can be arranged and adjusted (Figure 4).

Figure 3. Initial appearance of the application during testing

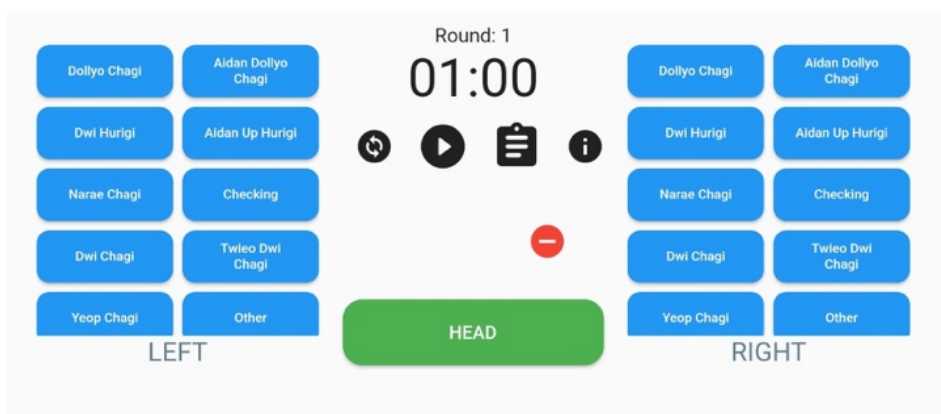


Figure 4. Final application display

### 3.5. Refining and Finalization

Improvements to deficiencies based on user feedback and field testing results are continuously being carried out.

This improvement involves changing the appearance of the application and improving security and data privacy aspects. This is done by adding some coding needed to fulfill the desired features (Figure 5)

```

void startRound(){
    buttonPlayIcon = Icon(Icons.pause_circle_filled_rounded);
    isPlaying = true;
    timer = Timer.periodic(const Duration(seconds: 1), (timer) {
    setState(() {
        countdown--;
        currentTime++;

        if(countDown <= 0){
            isPlaying = false;
            isFinish = true;
            timer.cancel();

            widget.fight.currentRound?.endTime = DateTime.now();

            ScaffoldMessenger.of(context).showSnackBar(
                SnackBar(content: Text('Round ${widget.fight.currentRound!.round} has ended')),
            );

            if(widget.fight.nextRound()){
                buttonPlayIcon = Icon(Icons.arrow_circle_right);
            }
            else{
                buttonPlayIcon = Icon(Icons.check_circle);
            }
        }
    });
    }); // Timer.periodic
}
    
```

Figure 5. Coding improvements in applications

### 3.6. Implementation and Dissemination

The newest application officially arrives on the Android platform on June 3, 2023 (Figure 6). The application has also been socialized to the taekwondo community, coaches, and athletes. Dissemination of creations and official training on product use also continue to be intensified so that the application can be put to good use in the sport of taekwondo.

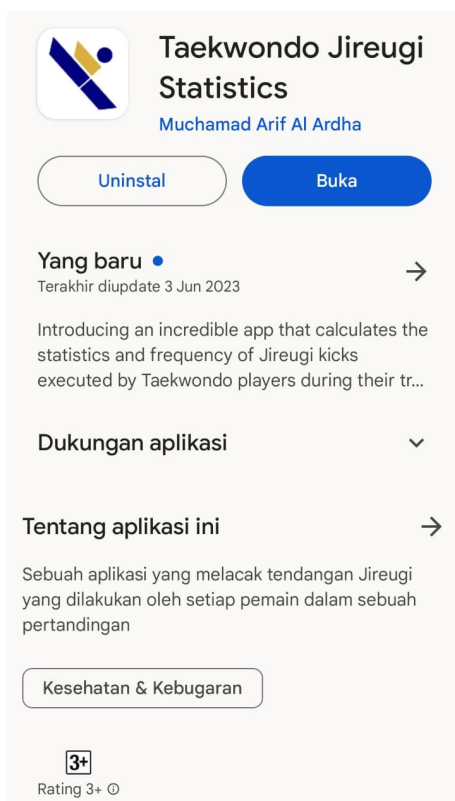


Figure 6. Latest release on Android playstore

### 3.7. Evaluation and Maintenance

Follow-up evaluation after launch to ensure performance and user satisfaction is always carried out. This is carried out through input from users regarding performance and identifying areas of improvement in the interactive chat on the Android Playstore page. Application maintenance and improvements are also continuously carried out to ensure application sustainability and security.

## 4. Discussion

This study aims to develop a statistical application that focuses on analyzing matches in the sport of Taekwondo. The analysis carried out with this application will become evaluation material for coaches and athletes after the match. The game patterns observed from the analysis results also become the coach's strategy in determining future training programs.

### 4.1. Analysis of Attack Techniques

Attack technique analysis involves recording and evaluating the various types of attacks performed by athletes during a taekwondo match [16]. Understanding the successes and failures of offensive techniques helps coaches and athletes identify effective strategies and correct weaknesses in their techniques [17]. The application can record the type of attack technique (kicks, punches, and blocks) used [18]. Statistical results can show the effectiveness of each technique and the target zones most frequently targeted [19].

### 4.2. Winning and Losing Predictions

Focus on recording match results, both wins and losses, and analyzing the factors that influence these results [20]. Analyzing wins and losses helps identify patterns of successful or unsuccessful play [21], supporting the development of strategies for future matches [22]. The application can record match results and compare statistics between won and lost matches. Identify trends and key factors that influence match outcomes.

### 4.3. Match Intensity Monitoring

Monitoring match intensity involves measuring the level of activity and intensity of athletes during the match [23]. Understanding match intensity helps in training planning and ensures athletes are prepared for competitive condition [24]. The application can record the duration and intensity of an athlete's activity during a match.

This data helps coaches adjust training programs to increase stamina and endurance [25].

#### 4.4. Analysis of Tactics and Game Patterns

Focus on recording and analyzing the tactics used by athletes during the match, including tactical changes, and adaptations during the match [26]. Understanding the opponent's tactics and athletes' tactical adjustments helps in the development of more effective match strategies [27]. The application can record changes in tactics, use of combination attacks, and responses to opponent tactics [28]. Graphs or diagrams can visualize game patterns and adaptations during the game.

#### 4.5. Monitoring Physical Condition and Recovery

Monitoring of physical condition and recovery period is carried out during and after the competition [29]. Understanding physical condition helps prevent injury, ensure proper recovery, and adjust training programs. The app can record fatigue levels, heart rate and other physical factors during the game [30]. Post-match recovery analysis can provide insight into the effectiveness of an athlete's recovery program. Through statistical applications focused on these topics, coaches and athletes can utilize data to optimize strategies, improve performance, and achieve better results in taekwondo competitions [31].

### 5. Conclusion

The development of an Android-based statistical application for analysis of Taekwondo matches is a significant step forward in supporting the understanding and improvement of the performance of athletes and coaches in the world of taekwondo. This application provides an innovative technological solution to record, analyze, and interpret match data more efficiently. By using Android technology, this application provides wider reach and high mobility, allowing users to access statistical data anywhere and at any time. In addition, this application also helps improve the safety and security of athletes by better monitoring their physical condition during matches.

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