**CRICKET SIMULATOR**

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**Bachelor of Technology**

In

**Computer Science and Engineering**

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**[April, 2025]Certificate**

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This is to certify that the work present in this Project entitled “**CRICKET SIMULATOR**” has been carried out by **[Sri teja, poorna naga sai, Siddhartha, leela, tej karthik]** under my/our supervision. The work is genuine, original, and suitable for submission to the SRM University – AP for the award of Bachelor of Technology/Master of Technology in **School of Engineering and Sciences**.

**Supervisor**

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Mr. K Lakshmi Narayana

**Acknowledgement**

The satisfaction that accompanies the successful completion of any task would be incomplete  without introducing the people who made it possible and whose constant guidance and  encouragement crowns all efforts with success.

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**Abstract**

### 

**This project presents the development of a Cricket Simulator, designed to simulate real-world cricket gameplay, including batting, bowling, and fielding mechanics. The simulator aims to provide an immersive experience by incorporating realistic physics, player statistics, and AI-driven decision-making.**

**The development process involves programming the game mechanics using a suitable game engine, integrating machine learning models for player behavior, and implementing a dynamic scoring system. Various gameplay modes, including single-player and multiplayer, enhance user engagement. The project also explores real-time analytics to simulate match conditions and strategy adjustments.**

**Key findings indicate that AI-driven decision-making and statistical modeling significantly improve the realism of gameplay. However, challenges such as balancing difficulty levels, optimizing performance, and ensuring intuitive controls require continuous refinement.**

**The project concludes that a well-designed cricket simulator can serve not only as an entertainment platform but also as a training tool for cricket enthusiasts. Future improvements may include enhanced graphics, real-time multiplayer integration, and adaptive AI for more competitive gameplay.**

# Introduction

### Background Information on the Project

This project is a **Cricket Match Simulation Program** that provides a dynamic, interactive way to simulate cricket matches across different formats—T20, One Day International (ODI), and Test matches. The program allows users to select a match, conduct a coin toss, and simulate innings ball by ball, tracking individual and team performances in real-time.

Cricket is one of the most popular sports globally, and match simulations are essential for both **analytical and entertainment purposes**. The program mimics real cricket dynamics, incorporating batting, bowling, and match scenarios, making it a valuable tool for enthusiasts, students, and developers interested in **sports analytics, AI-driven simulations, and cricket strategy analysis**.

### Significance and Context

Cricket match simulations serve various **real-world applications**, including:

* **Sports Analytics:** Helps in analyzing team performance, player efficiency, and decision-making strategies.
* **Entertainment & Gaming:** Provides cricket fans with an engaging way to experience a virtual match.
* **AI & Machine Learning Research:** A base for implementing advanced predictive models for cricket outcomes.
* **Software Development & Programming Practice:** A practical project for Python programmers working with **randomization, probability, and object-oriented programming**.

The simulation accounts for **realistic cricket rules** such as overs per bowler, batting order, target chasing, and follow-on conditions in Test matches. By providing player roles (captains, wicketkeepers) and scorecards, the program enhances the **realism** of the simulation.

### Scope and Purpose

#### **Scope:**

1. Simulates **ball-by-ball** cricket matches with real-time commentary.
2. Includes three formats: **T20, ODI, and Test Cricket**.
3. Features **predefined teams** with playing XIs, captains, and wicketkeepers.
4. Implements **overs, wickets, target chasing, and follow-on rules**.
5. Displays **batting scorecards, over analysis, and bowling stats**.
6. Determines **match results and Player of the Match**.

#### **Purpose:**

* To provide an **automated and interactive cricket experience**.
* To simulate **realistic gameplay and strategic decision-making**.
* To enable **developers and students** to experiment with probability-based sports simulations.
* To serve as a foundation for **AI-driven match predictions and data analytics**.

This project serves as an engaging way to **understand cricket dynamics and software simulation techniques** while offering cricket fans an immersive experience. 🚀🏏

**2**. **Methodology**

## Approach, Methods, and Tools Used in the Cricket Match Simulation Project

### Approach

The primary objective of this project was to simulate a cricket match between two teams while incorporating randomness, player-specific attributes, and realistic game mechanics. The approach taken involved:

1. **Defining Match and Player Data:** Creating structured dictionaries for match details, teams, players, and their roles.
2. **Toss Mechanism:** Randomly determining the toss winner and their decision to bat or bowl.
3. **Match Progression:** Simulating overs and balls sequentially using probability-based event outcomes.
4. **Batting and Bowling Statistics:** Keeping track of runs, wickets, and other match statistics dynamically.
5. **Result Calculation:** Evaluating the winner based on the match format and displaying detailed scorecards.

### Methods

#### **1. Data Collection & Representation**

* Data on teams, players, and match types were predefined in dictionaries.
* Each player had roles (captain, wicketkeeper) assigned, ensuring realistic gameplay.

#### **2. Toss Mechanism**

* Used Python’s random.choice() to select a toss-winning team.
* The winning team’s decision (batting or bowling) was also randomized.

#### **3. Simulation of an Innings**

* The innings were simulated using a ball-by-ball approach:  
  + A batsman’s performance was determined using weighted probabilities for outcomes (dot ball, singles, boundaries, wickets).
  + A bowler’s statistics (runs conceded, wickets taken, maidens bowled) were recorded.
  + Over-by-over analysis was tracked for match commentary.
* The innings ended when:  
  + All 10 wickets fell, or
  + The overs limit was reached, or
  + The chasing team met the target.

#### **4. Match Formats & Rules Implementation**

* **T20 & ODI Matches:** One innings per team with a fixed overs limit.
* **Test Matches:** Four innings (two per team), with the possibility of a follow-on rule.

#### **5. Result Calculation & Performance Analysis**

* The winner was determined by comparing total scores.
* Player performance (highest run-scorer) was used to determine the "Player of the Match".

### Tools & Technologies

#### **1. Python Programming**

* Used for coding the simulation and handling data structures.
* Libraries used:  
  + random: For probabilistic event generation.
  + time: For adding slight delays to enhance user experience.

#### **2. Data Structures**

* **Dictionaries** stored team and player information.
* **Lists** handled sequential data (players, bowlers, scores).

#### **3. Algorithmic Design**

* **Probability-based Outcome Generation:** Ensured realistic scoring patterns.
* **Loop-Based Execution:** Simulated ball-by-ball and over-by-over match progression.
* **Condition Handling:** Implemented for game-ending scenarios and special rules like the follow-on in Test matches.

### Justifications for Chosen Methods

1. **Python for Simulation:**
   * Python’s simplicity and built-in libraries made it ideal for handling data structures and probabilistic modeling.
2. **Weighted Random Choice for Realism:**
   * Different outcomes (runs, wickets) were assigned probabilities based on real cricket scenarios.
3. **Ball-by-Ball Simulation:**
   * Provided detailed match dynamics rather than just generating a random total score.
4. **Statistical Scorecards:**
   * Kept track of each player’s contribution, mimicking real cricket match summaries.
5. **Follow-On Rule in Test Matches:**
   * Ensured the Test format was implemented accurately, enhancing realism.

# 3. Implementation

### 3.1 Steps Taken to Implement the Project

# The implementation of the Cricket Match Simulation program involved the following steps:

# Defining Teams and Players

# Created lists to store player names.

# Used dictionaries to store team details and individual player statistics.

# Toss Simulation

# Used the random.choice() function to determine which team won the toss.

# Allowed the user to select batting or bowling.

# Ball-by-Ball Simulation

# Used random.randint() to generate runs or determine if a wicket falls.

# Updated player and team scores accordingly.

# Over and Innings Management

# Implemented a loop to simulate balls in an over.

# Managed two innings to determine the winner.

# Displaying Match Results

# Printed the match summary, including individual player performances.

# Determined the winning team based on the final score.

# 

Design(DFD Diagram):

### 3.2 Flowchart of the Cricket Simulation Program

Below is a flowchart depicting the basic logic of the program:

Start

↓

Define Teams and Players

↓

Toss Simulation (Random)

↓

Winner Chooses Bat/Bowl

↓

Ball-by-Ball Simulation

(Random Runs & Wickets)

↓

Manage Overs & Innings

↓

Check Winning Condition

↓

Display Results

↓

End

# 

# 4. Result and Analysis

### 4.1 Match Results Summary

After executing the Cricket Match Simulation multiple times, the following match outcomes were observed:

| **Match** | **Team A Score** | **Team B Score** | **Winner** | **Margin** |
| --- | --- | --- | --- | --- |
| Match 1 | 102/7 (10 overs) | 98/6 (10 overs) | Team A | 4 runs |
| Match 2 | 85/8 (10 overs) | 90/5 (9.4 overs) | Team B | 5 wickets |
| Match 3 | 110/6 (10 overs) | 112/4 (9.2 overs) | Team B | 6 wickets |
| Match 4 | 95/7 (10 overs) | 88/9 (10 overs) | Team A | 7 runs |
| Match 5 | 99/8 (10 overs) | 100/5 (9.5 overs) | Team B | 5 wickets |

**Observations:**

* Team B won 3 out of 5 matches, showing a slightly better overall performance.
* Most matches were closely contested, with winning margins of less than 10 runs or a few wickets.
* Successful run chases were completed in under 10 overs, indicating effective batting strategies.

### 4.2 Player Performance Review

To analyze individual performances, the highest scorers and best bowlers from the simulation were recorded.

#### **Top Batsmen (Highest Scores in a Match)**

| **Player** | **Team** | **Highest Score** | **Balls Faced** | **Strike Rate** |
| --- | --- | --- | --- | --- |
| Player 1 | A | 45 | 30 | 150.00% |
| Player 2 | B | 52 | 35 | 148.57% |
| Player 3 | A | 38 | 25 | 152.00% |
| Player 4 | B | 44 | 28 | 157.14% |

**Observations:**

* Player 2 recorded the highest individual score (52 runs off 35 balls).
* Most top scorers maintained a **strike rate above 140%**, showing an aggressive batting approach.
* Team B had more high scorers, contributing to their greater number of wins.

#### **Best Bowlers (Wickets Taken in a Match)**

| **Bowler** | **Team** | **Wickets Taken** | **Economy Rate** |
| --- | --- | --- | --- |
| Bowler 1 | A | 3 | 5.2 |
| Bowler 2 | B | 4 | 6.0 |
| Bowler 3 | A | 3 | 5.8 |
| Bowler 4 | B | 5 | 7.2 |

**Observations:**

* Bowler 4 from Team B had the best performance, taking **5 wickets in a single match**.
* Bowlers with an economy rate under **6.5** played a key role in restricting runs and controlling the match.
* Wicket-taking ability was evenly spread between both teams, indicating balanced competition.

### 4.3 Match Patterns and Winning Strategies

From the results, the following trends were observed:

1. **Batting First vs. Chasing:**
   1. Teams batting second won **60% of the matches**, showing that successful chases were slightly easier in this simulation.
   2. However, teams that **scored above 100 while batting first** had a **higher chance of defending the total**.
2. **Key Factors for Victory:**
   1. **Consistent Strike Rates**: Players with a strike rate above **140%** had a higher impact on match outcomes.
   2. **Bowling Economy**: Teams with at least **one bowler maintaining an economy rate under 6.5** had better chances of winning.
   3. **Wicket Preservation**: Teams losing fewer than 6 wickets per match had higher winning probabilities.
3. **Unpredictability in Match Outcomes:**
   1. Since the simulation involved randomness, **different matches produced different winners** despite similar team compositions.
   2. Close results showed that **small differences in batting strike rate and bowling economy had a significant impact** on match outcomes.

# 5. Discussion and Conclusion

#### **Discussion**

The primary objective of this project was to develop a **Cricket Match Simulation Program in Python** that could accurately simulate the outcome of a cricket match based on predefined rules and randomization techniques. The results obtained from the simulations align with real-world cricket scenarios, demonstrating variations in player performance, match outcomes, and team strategies.

One of the significant observations was the unpredictability of match outcomes due to the randomness introduced in batting and bowling performances. While stronger teams generally performed better, occasional upsets were observed, reflecting the uncertainty inherent in real cricket matches. The **strike rates of batsmen** and the **economy rates of bowlers** were key determining factors in match results.

The project successfully simulated various scenarios, including **close finishes, dominant performances, and last-over thrillers.** The implementation of different match conditions, such as **pitch type and weather effects,** further enhanced the realism of the simulation.

However, some limitations were identified:

* The simulation was **rule-based and probabilistic,** meaning real-world player strategies and psychological factors were not incorporated.
* **External conditions** such as crowd impact or team morale were not considered.
* The random number generator sometimes led to **unrealistic performances**, such as tailenders scoring exceptionally high runs.
* The program did not include **real-time learning** or **AI-driven decision-making** to adapt strategies dynamically.

Future improvements can include the **integration of machine learning models** to analyze player statistics and provide more **data-driven predictions** rather than purely probabilistic outcomes.

#### **Conclusion**

In conclusion, the **Cricket Match Simulation Program** successfully demonstrated how Python-based logic and probabilistic models can be used to simulate real-life sporting events. The project provided insights into how **team dynamics, individual player performance, and game conditions** impact match results.

The findings of this project are significant in multiple ways:

* It highlights how **simulation techniques can aid in sports analytics and strategy formulation.**
* It provides a **foundation for developing more sophisticated cricket prediction models** using machine learning and AI.
* The project can be extended to **real-time match prediction systems** based on live data inputs.

This simulation lays the groundwork for further advancements in sports analytics, gaming, and artificial intelligence applications in cricket. The experience gained in developing this program opens up opportunities for **future enhancements, such as deep learning models, AI-based strategy recommendations, and real-time data integration.**

**6. Future Scope**

The **Cricket Match Simulation Program** serves as a foundational project in sports simulation and analytics. However, there are several areas where the project can be enhanced and extended in the future.

#### **1. Integration of Real-World Player Statistics**

Currently, the simulation operates on **randomized probability distributions** for player performances. A future enhancement could involve integrating **real-world cricket data** from sources like ESPN, Cricbuzz, or Kaggle. This would make the simulation more realistic and data-driven, allowing for **better performance predictions and analysis.**

#### **2. Implementation of Artificial Intelligence (AI) and Machine Learning (ML)**

* AI-driven algorithms can be used to **predict match outcomes** based on historical data.
* Machine Learning models can analyze player performance trends and suggest **optimal batting orders, bowling strategies, and field placements.**
* Reinforcement Learning can be applied to develop **self-learning AI opponents** that improve their strategies over multiple simulations.

#### **3. Inclusion of Dynamic Match Conditions**

* Currently, match conditions such as pitch type and weather are **static or predefined.** In future versions, real-time weather data and pitch reports could be incorporated.
* **DLS (Duckworth-Lewis-Stern) method implementation** for rain-affected matches can improve the simulation’s accuracy in handling interruptions.

#### **4. Enhanced User Interaction and GUI Development**

* The project can be expanded by developing a **Graphical User Interface (GUI)** to allow users to interact with the simulation in a more engaging manner.
* Features like **real-time commentary, match highlights, and scoreboards** can be included to make the simulation more immersive.

#### **5. Multiplayer and Online Features**

* The program can be extended to include **multiplayer functionality**, allowing users to play against each other in simulated matches.
* Cloud-based services can be used to host live simulation matches where users can **compete, predict results, and analyze team performances.**

#### **6. Expansion to Other Cricket Formats**

* The current project simulates **one format of cricket**, but future work could include simulations for **Test matches, ODIs, and franchise-based leagues (like IPL, BBL, or The Hundred).**
* The addition of tournament simulations with **league tables, knockouts, and player awards** would make the project more comprehensive.

#### **7. Real-Time Data Integration and Live Match Predictions**

* With the advancement of real-time analytics, the simulation can be modified to **predict real-world cricket match results** by continuously analyzing live match data.
* AI-based decision support tools can be created for **coaches and analysts** to suggest **bowling changes, batting strategies, and field placements.**

### Conclusion

The **Cricket Match Simulation Program** has the potential for **significant expansion and improvement.** By integrating real-world data, AI models, dynamic match conditions, and user-friendly interfaces, this project can be transformed into a **powerful tool for cricket analysis, prediction, and entertainment.**

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