

INTRODUCTION

1.1 Background

The development of the game industry today is so rapid with a wide variety of genres. One of the most popular types of games is the life simulator genre game. This type of game seeks to simulate everyday life. This game also utilizes artificial intelligence. Research (Yulsilviana & Ekawati, 2019) Almost all games have common features that are often encountered today, namely, *Artificial Intelligence* is an artificial intelligence provided on computer systems (machines) capable of learning, reasoning and self-correcting as if AI (*Artificial Intelligence*) is against other players.

A game has a variety of AI (*Artificial Intelligence*) that gives a more interesting game impression. AI (*Artificial Intelligence*) that is often used includes *finite state machines, trigger detection, fuzzy sugeno* and *decision trees*. Research (Marzian & Qamal, 2017) AI (*Artificial Intelligence*) is often used in classic game games such as pacman and mario bros, to complex games such as GTA (Grand Theft Auto). The use of AI (*Artificial Intelligence*) varies with the needs required by game developers, so that games can run as desired.

Research (Yudistira et al., 2016) The development of PES (*Pro Evolution Soccer*) began in 1994, but at the time this game was released it was called ISS (*International Superstar Soccer*). With its development in the PlayStation era in 2001 Konami changed the name of game from ISS (*International Superstar Soccer*) to PES (*Pro Evolution Soccer*). PES (*Pro Evolution Soccer*) game continues to get updates so that it can be played on various platforms including Microsoft Windows, Xbox, PlayStation 1, PlayStation 2, PlayStation 3, PlayStation 4, PlayStation 5 and PlayStation Portable (PSP).

One of the applications of artificial intelligence in games for intelligent decision making is the FSM (*Finite state machine*). The *Finite state machine* method is a good method in modeling the behavior of NPC (*Non-Player Character*) agents. Research (Yulsilviana & Ekawati, 2019) FSM (*Finite state machine*)

method using *interrelated* states (conditions), *events* (Events), *actions* (actions). In determining the feasibility of FSM on NPCs, fuzzy logic is used to predict that the NPC can determine that the game is more interesting. The application of the FSM (*Finite state machine*) method to NPCs (*Non-Player Character*) can look like making decisions when the conditions contained in NPC (*Non-Player Characters*) are reached.

FSM consists of two types, namely Deterministic Finite Automata (DFA) and Non-deterministic Finite Automata (NDFAs). What distinguishes the two is that DFA has only one state transition direction, while in NDFAs it can have more than one state transition direction. The research (Richardson et al., 2019) used *the Non-Deterministic Finite Automata* (NDFAs) method in modeling the design of a vending machine simulation application. Research (Wirasbawa et al., 2019) Non-deterministic Finite Automata (NDFAs) is the most appropriate method for modeling a process from machines, applications, and games.

Based on the explanation above, the author is interested in designing a modeling NPC (*Non-Player Character*) game in PES (*Pro Evolution Soccer*). With the method used in the analysis of the PES (*Pro Evolution Soccer*) game is NDFAs (Non-deterministic Finite Automata). The NDFAs (Non-deterministic Finite Automata) method is an NPC analysis method that aims to find out that PES 2021 applies FSM artificial intelligence to pes 2021.

1.2 Problem Formulation

Based on the background above, several problems can be formulated as follows:

1. How to model PES games with the NDFAs method
2. How is the result of the PES 2021 evaluation after being modeled with the NDFAs method

1.3 Purpose

The purpose of this study is based on the formulation of the problem above as follows

1. Knowing how to model PES games with the NDFAs method

2. Knowing the evaluation results of modeling with the NDFA method

1.4 Limitations of the Issue

So that the scope of the study does not expand, the author limits the problems in the study as follows:

- a. The method of the game analysis algorithm used is NDFA
- b. The Validation Model uses 10 iterations in the game play.
- c. The game that will be analyzed is pes 2021.
- d. The football clubs playing are Barcelona and Real Madrid