I. INTRODUCTION

Based on information from the Fire and Rescue Service, the area of fire types in 2018 increased from the previous year. Judging from the information on the location of fires from January to April 3 2018, the wide variety of fire incidents in Jakarta has reached 873 cases [1]. For this reason, prevention is very important so that it can be saved from indoor fire cases [2].

One of the important aspects in the construction of houses, buildings, and others is protection against fire cases [3]. The realization of these security measures is generally realized in efforts to prevent and control fire cases [4]. A fire alarm consists of several different devices that work together and can detect fire or smoke and use audio and visual tools to alert others [5]. Active protection systems can be used for fire safety in buildings and are designed to detect and extinguish fires at an early stage (such as sprinklers and heat and smoke detectors) [6].

Several internet of things (IoT)-based smoke or fire detection designs have been made in other previous studies [7] [8]. However, it is necessary to analyse several methods in designing a prototype fire extinguishing system and which algorithm is suitable to be applied to the system [9].

An earlier study showed that an IoT system can implement a fire sprinkler using a water pump controlled by a microcontroller but does not apply a control system with a well-proven method [10]. Meanwhile, several other studies have shown that the Fuzzy inference system (FIS) has high accuracy when applied to an IoT-based fire system [11] [12] [13].

This research focuses on designing and evaluating a smart fire sprinkler device prototype device that can detect and extinguish fires based on FIS classification and send the information to an android application using the IoT. FIS classification uses the Fuzzy Logic Tsukamoto method.

Fuzzy Logic Tsukamoto have similar inference process to Fuzzy Logic Sugeno. Each rule in Tsukamoto inference spescified by motonous founction on complex fuzzy set. The output of fuzzy obtained based from the alpha-predicae value, than calculated by weighted average formula to get the final result [14].

Fuzzy logic was chosen as a method for classification because it has flexible decision making nature like a human mindset and can handle several parameters [15]. The code space of fuzzy logic is efficient and works with if-then rules as a decision-making algorithm and can easily be interpreted into real situations [16].

The FIS classification is based on several inputs taken from three sensors, which are a MQ-2 smoke sensor, DHT-11 temperature sensor, and KY-026 fire sensor. The sensor readings are controlled by an Arduino Uno, acting as the microcontroller of the system. The IoT system connectivity is provided by an ESP8266 chip that has Wi-Fi capability.