**Design and implementation of fuzzy logic-controlled smart solar tracking system *Zaid AL-IBRAHIME1,[[1]](#footnote-1)\**,*prof.dr Fatih KORKMAZ2***

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| **Abstract** This paper proposes to build a multi-axis, closed-loop smart solar tracking system capable of moving 360° horizontally and 180° vertically with a starting angle of 90° so that the system can know the start angle without the need to know the azimuth angle. In addition to the system being able to protect the photovoltaic cells from damage, it continuously changes the direction of the solar panel by 180° if the solar temperature exceeds 45°C and then returns to track after the temperature drops below that. The fuzzy logic controller will be responsible for controlling and directing all elements of the system and determining the time to move the panels so that they face direct sunlight. and collecting data using a recording unit (SD card) and storing it on a memory card, which may be accessed at any time, to verify the system's efficiency and identify weak points.The importance of the research is using 8 sensors (LDR) programmed according to a special mathematical algorithm instead of 4. This approach allows the system to effectively handle partial shading and maintain accurate tracking even if one of the sensors malfunctions. As a result, this system exhibits a high level of tracking accuracy. The system employs two motors: a DC motor with a gearbox for horizontal rotation and a servo motor for vertical rotation. The results of this study indicate that employing a fuzzy logic controller yielded superior precision in comparison to alternative software. Additionally, the utilization of 8 LDR sensors, two motors, and a temperature sensor resulted in enhanced practical accuracy for the system, enabling it to achieve maximum photovoltaic energy output over the longest possible period of time. |
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