

Application of AI Systems in Transmission Line protection

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Abstract: The present age of digital protection devices permits the execution of versatile techniques for power system protection. This paper exhibits an outline of the utilization of Artificial Intelligence (AI) strategies to improve a few parts of power system protection, particularly adaptive protection. Every method is quickly depicted and in the arrangement a few uses of this strategy to the issue being talked about are displayed. The examination centers around the accompanying methods: Multi-specialist Systems, Artificial Neural Networks, Genetic Algorithms, Expert Systems and Fuzzy Logic. This review demonstrates that with the innovation accessible today, some old unsolved issues of power system protection would now be able to be understood and surely understood security methods of insight can turn out to be increasingly effective and reliable

Keywords: Digital Protection, Artificial Intelligence, Power System Protection.

I. INTRODUCTION

In the latest decades, Electrical Power Systems (EPS) have enhanced to satisfy a creating requirement for electrical power. They also ended up being continuously interconnected and difficult to work, administrators. As such, the endeavors of working, organizing and verifying these systems can never again be held in the standard structure. The protection of EPS ought to think about that the topology and the stacking of these systems are constantly changing, requiring adaptable systems to improve its amplexness. Something different, the affirmation of the system may end up inconsequential for certain weakness conditions. The possibility of adaptable security is shown as a hypothesis that changes the insurance devices to suit the fluctuating conditions of the electrical system . The use of adaptable protection is possible when best in class moves are associated, pondering their ability to change their setting on-line and planning speed. Nevertheless, a couple of perspectives may be improved with the use of Artificial Intelligence (AI) systems identified with such contraptions Theorem Style. A couple of AI methods have been proposed to deal with issues related to the region of security of electrical systems. Different works can be found in the composition with promising results. Some AI strategies are more appropriate than various to the degree adaptable protection is concerned. This paper will immediately show some AI strategies that are starting at now being used to execute adaptable systems to verify EPS. In the gathering other AI strategies are analyzed in order to highlight incorporates into explicit employments of power system security

II. ARTIFICIAL INTELLIGENCE TECHNIQUE

Some microchip protection devices license the arrangement of get-togethers of insurance settings. Man-caused thinking methodologies to can be used to streamline these settings and the reason that portrays which social affair ought to be dynamic in the midst of the online assignment of the insurance system. Another factor that advantages the adaptable procedure is the usage of submitted PC composes in electric essentialness utilities, growing the trustworthiness of correspondence infers. In the accompanying things some AI strategies associated with improve control system security (flexible or not) are inspected.

A. ARTIFICIAL NEURAL NETWORKS (ANNS)

The Artificial Neural Network (ANN) is a multilayered parallel structure, taking after the mind in two aspects.

1. Knowledge is procured by the system from its condition through a procedure of "learning".
2. Forces of association between neurons, known as synaptic loads, are utilized to store the learning obtained.

B. ATTRIBUTES OF ANNS

Non-Linearity: Usually the physical component in charge of producing the info signals is naturally non-straight;

Generalization: Produces yield appropriate for sections that have not been exhibited amid the preparation ("learning") stage;

Mapping of Input-Output: arrangement of examples (maps the current input– yield relationship in a progressively exact manner);

Adaptability: It very well may be retrained to manage minor changes. It very well may be intended to adjust its loads progressively;

Response to Evidence: It can give data about the certainty or faith in the choice give at its yield;

Fault resistance: Even with the loss of neurons, it supplies reliable reactions at its yield.

The attributes sketched out above have driven a few creators to pick this AI strategy for the improvement of instruments with the goal of improving the protection of EPS. Then again, one trouble habitually discovered while executing ANNs is the need of a lot of authentic or reenacted cases to use in their learning and assessment stages.

III. AI APPLICIATIONS IN POWER SYSTEM FOR IMPROVING PROTECTION

A. MULTI-AGENT SYSTEMS (MS)

In order to appreciate the use of a MS for adaptable security, a significance of "master" is indispensable. A couple of makers describe "administrator" in a way that is progressively fit to the application they have at the highest point of the need list. In a couple of definitions are shown. This paper presents Pattie Maes' definition: "Self-administering administrators are computational systems that consume some staggering unique condition, sense and act independently in this condition, and by doing thusly comprehend a ton of goals or endeavors for which they are arranged." MS are designated Distributed Artificial Intelligence and to play out their errands a reliable correspondence system is fundamental. Through this correspondence mastermind the administrators can connect with each other and with the earth where they possess. Right when associated with control system watching and security, the administrators assemble data from an arrangement of shrewd devices (IED-Intelligent Electronic Device) and reliant on these data they execute their errands. Electric vitality utilities have been adjusting their devoted PC systems (intranet) to regard the prerequisites important to the utilization of IEC 61850. These upgrades give the highlights important to execute MS in security systems. A portion of these highlights are recorded beneath:

- a. High limit of information transmission.
- b. Management of Information: better combination among the gadgets in charge of the system protection
- c. Operating System: plausibility of remote observing and control.

B. APPLICATIONS OF MS TO POWER SYSTEMS PROTECTION.

The protection of electrical power systems has the typical for being dispersed, as a general rule an insurance device verifies only a solitary piece of rigging (transformer, busbar, transmission line, etc.). This component supports the utilization of MS. Administrators can be accountable for recognizing huge changes in the power system and after that adjust the settings of mechanized exchanges to improve their response in this new condition. In the creators present MAWAPS (Multi-Agents and WAN based Adaptive Protection System), which means to adjust the settings of advanced transfers to the states of the activity of an electric power system. The primary specialists in this system are characterized as appeared in the table 1.

Table 1: Architecture of MAWAPS

Agent	Task
Dispatching	Detects a change of a switch state.
Communication control	Controls messages according to their priorities and ensure that they arrive at destinations in time.

Network topology analysis	Reviews and updates the network topology when the state of changes.
Impedance matrix computation	With the new topology data calculates the impedance matrix.
Adaptive setting calculation	Calculate the adjustments according to the impedance matrix, calculates of the short-circuit current.
Relay	Runs the algorithm to decide whether the protection should work or not.
Mobile management	Manages the mobile agents system
Network monitoring	Monitors the communication network and assesses its capacity.

C. APPLICATION OF AI SYSTEMS IN TRANSMISSION LINE

- If any fault occurs in the transmission line, the fault detector detects the fault and feeds it to the fuzzy system. Only three line currents are sufficient to implement this technique and the angular difference between fault and pre-fault current phasors are used as inputs to the fuzzy system. Fuzzy systems can be generally used for fault diagnosis.
- Artificial Neural Networks and Expert systems can be used to improve the performance of the line. The environmental sensors sense the environmental and atmospheric conditions and give them as input to the expert systems. The expert systems are computer programs which provide the value of line parameters to be deployed as the output.

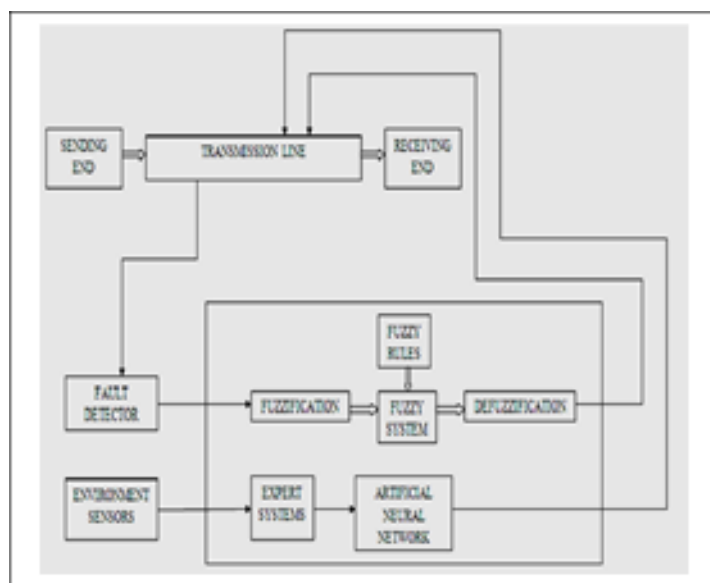


Fig.1: Practical Application of AI Systems in Transmission Line

D. APPLICATIONS OF AI SYSTEMS IN POWER SYSTEM IN PRESENT SCENARIO.

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IV. CONCLUSION

This analysis intended to existing the utilization of man-made brainpower procedures Applications of AI Systems in Power System in Present Scenario.

- Operation of power system like unit commitment, hydro- thermal coordination, economic dispatch, congestion management, maintenance scheduling, state estimation, load and power flow.
- Planning of power system like generation expansion planning, power system reliability, transmission expansion planning, reactive power planning.
- Control of power system like voltage control, stability control, power flow control, load frequency control.
- Control of power plants like fuel cell power plant control, thermal power plant control.
- Control of network like location, sizing and control of FACTS devices.
- Electricity markets like strategies for bidding, analysis of electricity markets.
- Automation of power system like restoration, management, fault diagnosis, network security to control system security, chiefly to the versatile protection issue. A few AI applications to this issue were found in the writing and some of them have been quickly portrayed in this paper. Every system has specific highlights that might be favourable or hot when connected to tackle a particular issue.

This survey has demonstrated that the procedures all the more much of the time used to actualize versatile protection methodologies are multi-operator systems and counterfeit neural systems. Notwithstanding, the decision of an AI procedure for taking care of an issue relies upon a few components, including data dispersed or halfway found.

- The connection among data sources and yields is notable or not (demonstrate);
- The methodology generally connected to take care of the issue;
- Necessity or not of a constant arrangement;
- Existence or not of a pro eager to help in the improvement of a computational instrument.
- It ought to be called attention to that the utilization of man-made brainpower encourages the execution of the versatile protection reasoning in computerized transfers, which speaks to a noteworthy development in the protection of electrical systems. Previously, the protection engineer was compelled by the product given by the transfer maker, however at this point he has the opportunity to make new security capacities, which might be increasingly intricate and explicit to each case.

The utilities profit by the expansion in its system dependability, because of the decrease in the quantity of instances of unseemly protection conduct.

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