

## Thermal Control In Residential Building By Application of ANN

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**Abstract**— In this paper smart building concept is an implementation of technology developed in the construction industry throughout the world. Artificial Neural Network (ANN) based predictive and favorable thermal control strategies for residential buildings designed to advance thermal comfort. For residential buildings, we developed a thermal control strategy framework with ANN models incorporating the Artificial Neural Network (ANN) toolbox in MATLAB. Through the study we analyse to be found that application of ANNs in thermal control of residential building has potential for enhancing and to developing an indoor temperature control method that can provide comfortable thermal condition by integrating heating system control and the opening condition of building envelopes.

**keywords**—(ANN-Application Of Neural Network,framework)

### I. INTRODUCTION

The application of thermal control systems to residential buildings has been simplistic. The thermostat has been the principal control system because, at least *prima facie*, home owners did not see sophisticated control systems as economical. However, such perceptions have changed. Increasing awareness of quality of life, homeowners are to want thermal conditions in their homes good/helpful to improved comfort and health. In addition, as energy costs increase significantly, home energy efficiency acquires economic importance. Hence, In a new residential buildings demand for advanced climatic control strategies providing comfort, health and energy efficiency.

### Application of ANN in residential building for the thermal control

Artificial Neural Network has been applied for the many control system of the building. It has been applied for advanced thermal control of buildings. Comparable to the human brain and its neurons transfer system and learning process, ANN utilizes connectivity and transfer

functions between input, hidden, and output neurons, and successfully has been applied to non linear systems.

ANN models have adaptability through a self-tuning process, so can decide accurately without outside expert intervention when unusual annoyance, disturbances, or changes in building conditions occur. The study prove that the we can control on the to reduce the overheating and overcooling can be achieved through the adopting artificial neural networking.

It can be determine by ANN applied on to the start and stop times for heating systems. These can give the predictive values from ANN in the algorithms, the turning on time of the heating system for restoring the interior temperature to the comfortable level at the start for comfort condition for human body.

### Limitations

The currently available thermal control method, thermostat-dependent, creates thermal discomfort due to time-lag of heating or cooling equipment and late thermal response of the space. In most residential buildings, optimization of thermal comfort and energy consumption is not achieved. Recently developed predictive control strategies with ANN have improved this undesirable situation by creating comfortable air temperature condition.

### II. LITRATURE SURVEY

**Alexandrina-Elena C.Pandelea** :In this paper authors deals with the application of Artificial Neural Network in civil engineering. In a civil engineering were undertaken specific researches addressing various problems using Artificial Neural Networks with varying degree of success. Artificial intelligence is a multi-disciplinary field which has been created from the necessity to a deeper study of the possibility to create human behaviors. In this system is designed based on artificial intelligence must be able to store information, to apply those information to solve problem and learn new information through experiences. It provides solutions with greater accuracy than alternative modeling techniques and requires fewer requirement for modeling, in terms of knowledge represented shape function.

**Nivine Attoue,Isam Shahrour**: The author concluded that operative temperature could be well estimated by the ANN approach using the indoor temperature, electrical power,

outdoor temperature time of day, wall temperature, and ventilation flow rate. To improve comfort condition and user satisfaction use smart technology to reduce energy consumption. It is based on the use of smart sensors and software to follow both outdoor and indoor condition for the control of comfort ,and security devices for the optimization of energy consumption. The result of this work consist of the methodology proposed for the development of a simplified model for indoor temperature forecasting. This methodology is based on the selection of input parameters such as solar radiation, outdoor temperature history, outdoor humidity.

**Dawn John Mullassery:**The information about sensor technology used in smart building. Smart building integrate comfort and energy saving, further research in this field will help develop better and effective system some R&D may be useful in developing sensors with more precise data response.By developing technologies cheap but efficient, will drive more building to adapt this technology, which will further save energy. A combination of passive building and smart building can create a new era of high efficiency, self sustainable super building.Data from sensors and associated controller are now being used for building energy analytic and the technological advancement made in this field is very promising. Attaining this goal require adding intelligence from the initial step of design phase through to the end of useful life.

### III. OBJECTIVE

This study aimed to develop advanced thermal control strategy. ANN based thermal control method are developed ,Which control overall thermal conditions including not only air temperature but also humidity.

#### A. Energy Management

Energy is one of the most imperative aspects of country's technological progress. Efficient use of energy is essential for sustainable development. Thus the planning of energy saving measures, monitoring energy utilization, controlling and conserving energy is done by using Artificial Neural Network system and sensors.

#### B. Indoor Comfort

We spend most of our time in closed spaces like home, workplace, school for this reason indoor comfort to us is important. An interior space where people feel as comfortable as possible is a healthy living space. This indoor comfort is provided by using the Artificial Neural Network and by the use of sensors.

The energy efficiency of ANN-based predictive control strategies is comparatively investigated with non-predictive strategies.

#### C. Need And scope Of Study

Increased energy efficiency can save a sustainable amount of costs by effectively controlling equipment use. In addition, it is far easier to monitor aspects of the system for potential problems or provide preventative maintenance

Building management can provide better services to occupant and users. Accessing building systems via remote makes it easier for facilities professionals to assess real-time condition, detect problem and monitor building performance off-site. Data accuracy and report generation. More accurate data monitoring and control of energy.

#### D. Development Of Control Logics

In the development phase in control logics there are four control component were developed using MATLAB and its neural network toolbox.

- In first step, climatic conditions and personal conditions transfer to the control panel. User input are required in this step.
- In second step, The thermal comfort level, users set system operating ranges, or the logic recommends them for proper home climate control devices such as heating, cooling, humidifying and dehumidifying systems.
- In Third step, energy, users decide on a setback value and a period. Or the control system recommends them to reduce energy consumption.
- In Step four, decision of system operation, the control algorithm decides the operation of environmental control devices.

We have the information, such as current and past climatic conditions, personal conditions, operating range, and setback is utilized in this step.

In Step five, operation of control devices, the control devices such as heating, cooling, humidifying, and dehumidifying systems work for improving thermal conditions.

### IV. CONTROL SYSTEM

To improve the performance of the building control logics are tested through computer simulation. Using computer simulation, identical climatic conditions such as exterior air temperature and humidity could be applied to each simulation run.

#### A. DiscussionAnd Result

In this study at Day time and Night time two modes are applied ANN based predictive system, This improve thermal

control in the building. This study aimed to developing advanced thermal control strategies in residential building. In this predictive control system demonstrated that they could predict indoor temperature and humidity with a high accuracy, and that they were more advantageous in controlling home climate control devices in achieving user specified conditions than conventional thermostat control.

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