

Applications of Embedded Systems & Microcontrollers in Building Heating Systems

Mustafa Tahir,^a Mohammad Heiderinejad^a

^a*Armour College of Engineering, Illinois Institute of Technology, Chicago, Illinois, 60616*

*email: mtahir1@hawk.iit.edu *PI: muh182@iit.edu*

Abstract: While there are major efforts to decarbonize our building stock, a heating system with cast-iron radiator in buildings should be addressed because a large portion of older existing buildings are heated by radiators, whether hot water or steam (Ali et al. 2021). Additionally, these radiator systems have out of date controls, and 65% of the systems are in buildings built before 1990 and located in cities such as New York, Philadelphia, Chicago, Boston, etc (Rizi et al. 2020). Despite recent advancements in utilizing cost-effective sensors and microcontrollers, retrofitting legacy systems into existing structures remains a formidable challenge. This project aims to address this issue by focusing on the creation of cost-effective solutions for steam traps and radiator valve controls, utilizing advancements in low-cost sensors and microcontrollers (Ali et al., 2019). The primary goal of this research is to develop and test a low cost, continuous steam trap diagnostic monitoring device.

References

- [1] Ali, Akram Syed, et al. 'Elemental: An Open-Source Wireless Hardware and Software Platform for Building Energy and Indoor Environmental Monitoring and Control'. *Sensors*, vol. 19, no. 18, Sept. 2019, p. 4017. DOI.org, <https://doi.org/10.3390/s19184017>.
- [2] Syed Ali, Akram, et al. 'Development and Evaluation of an Automatic Steam Radiator Control System for Retrofitting Legacy Heating Systems in Existing Buildings'. *Energy and Buildings*, vol. 251, Nov. 2021, p. 111344. DOI.org, <https://doi.org/10.1016/j.enbuild.2021.111344>.
- [3] Rizi, B. S., Ali, A. S., Riley, C., Stephens, B., & Heidarinejad, M. (2020). Energy analysis of steam distribution system using a physics-based model: A campus building case study.