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Title :
Self-Tuning Fuzzy Pid Control PF Hydro-Diffusion Essential Oil Extraction System

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Essential oils (EO) is a substance extracted from a botanical material and always in high demanded. Steam distillation is a widespread method to isolate the essential oil from aromatic plants. The steam distillation method is most preferable due to factors of operational cost, cleanliness, system cost, high productivity and maintenance cost. However, some disadvantages of this method is loss of some volatile compounds, which will be diluted with boiling water within the distillation tank. The issue of steam distillation has not been given sufficient treatment in literature. The hydro-diffusion system was implemented as a viable alternative to overcome these setback. In the extraction process, the temperature will influence the final product of the extraction. The extraction temperature gives large effect on the percentage yield and quality of the oils. Almost all

compounds of essential oils are unstable at high temperature and should be regualted below the saturated temperture throughout the extraction process. In order to regulate the temperature, a suitable controller is required. Three controllers namely PID, HFPID and STFPID are proposed and integrated to hydro-diffusion system to control the steam temperature. All developed controllers are expected to improve system performance in both transient and steady state dynamics. The ARX structure has been used to represent the system dynamic and successfully implemented in the simulation studies. Real-time implementation of the simulated controllers have been carried out on the real extraction process. The performance of the proposed controllers were evaluated. All the controllers have shown their ability to track the set point change and curb the disturbance in real-time. However, the STFPID with 5 membership controller is the most preferable, and demonstrated better performance compared to the HFPID and PID controller. By applying the proper temperature control during extration process give better quality and preventing quality degradation of the essential oils.