

## ANIMAL WELFARE

**Title:** Development of a Real Time, Behavior-Based Swine Comfort Controller  
**NPB #99-108**

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### ABSTRACT

An innovative, animal welfare-enhancing environmental controller prototype has been developed. Unlike the conventional controller that uses merely air temperature to decide the operation of heating, cooling and ventilation devices, the new controller makes the decision according to the animals' resting behavior – a practice typically used by dedicated swine caretakers. Animals exhibit distinctive resting behaviors under cold, comfortable, and hot sensations. Obviously air temperature is not the only factor influencing thermal comfort of the pigs. Drafts, floor type and conditions, nutritional level, and health status of the animals are important contributing factors as well. Animals have the inherent thermoregulatory behavior of huddling when cold, resting side by side when comfortable, and spreading out when hot. Taking advantage of this inherent animal behavior, a computer imagery system is used to automatically capture the behavioral image, process and analyze it, and then classifies it into the proper thermal comfort state. The target temperature is then adjusted according to the classified thermal comfort status, which in turn determines the operation of the heating, cooling and ventilation devices. Behavioral images involving pigs in motion (eating, drinking, simply playing around, etc.) do not adequately reflect their thermal comfort status, and are thus excluded from the classification. Proper representation of spatial distribution of the pigs on the floor, i.e., selection of the image feature, is crucial and challenging to the success of this novel approach. Finding the image features independent of live body weight makes the matter even more challenging. Adequate computation speed is another requirement of this real-time system. All these components and requirements are integrated in the newly developed, real-time controller prototype. Laboratory-scale testing of the controller shows very satisfactory performance. Further testing and refining of the system under production settings is the logic next step.

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