VIETNAM NATIONAL UNIVERSITY, HANOI
VNU UNIVERSITY OF ENGINEERING AND TECHNOLOGY

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom – Happiness

INFORMATION ON DOCTORAL THESIS

1. Full name : **Phung Cong Phi Khanh** ..... 2. Sex: Male.....

3. Date of birth: 17/05/1976 ..... 4. Place of birth: Ha noi .....

5. Admission decision number: 654/QĐ-CTSV Dated: Sep. 05, 2016 .....

6. Changes in academic process: ....

(List the forms of change and corresponding times)

7. Official thesis title: Researching on building a model to monitor cows' behaviors.....

8. Major: Electronic Engineering .. 9. Code: 9520203.01 .....

10. Supervisors: Assoc. Prof. Tran Duc Tan

11. Summary of the **new findings** of the thesis:

- Build a seven-behavior classifier of cows using acceleration data.
- Build a system of cow behavior classification using synchronous data from accelerometers attached to the cow's foot and neck.

12. Practical applicability, if any:

In the livestock industry, raising cattle is an important part. High-tech cattle raising is being invested in and developed strongly. In the past, cow farming was very popular with households and farms worldwide. On a small scale, monitoring livestock's health status and reproduction would be very simple and follow the farmer's experience. However, monitoring becomes very difficult for farms or businesses that need to raise many cows for meat and milk or breeding stock if formal supervision is applied. Therefore, the results of the thesis have practical applicability.

13. Further research directions, if any: .....

1/ Design and implement a model of a real-time behavior classification system with the key point of which is a combination of leg-mounted and neck-mounted accelerometers for classification behaviors.

2/ Adding other behaviors such as ruminating, standing up, and lying down. A good understanding of the reproductive cycle in cows can help farmers deal with reproductive

problems in cows. This behavior is also essential when using drugs to control and synchronize the reproductive cycle in cattle.

3/ Research to detect and predict diseases of cows based on behavioral classification results.

14. Thesis-related publications: .....

(List them in chronological order)

A. Publications used in the thesis

Papers:

1. Duc Nghia Tran, Tu. N. Nguyen, **P. C. P. Khanh**, Duc-Tan Tran, "*An IoT-based Design Using Accelerometers in Animal Behavior Recognition Systems"*, IEEE Sensors Journal, 2021 DOI: 10.1109/JSEN.2021.3051194. [SCIE].

2. **Phung Cong Phi Khanh**, Duc-Tan Tran, Van Tu Duong, Nguyen Hong Thinh, Duc-Nghia Tran, "*The new design of cows' behavior classifier based on acceleration data and proposed feature set*", Mathematical Biosciences and Engineering, 2020, 17(4): 2760-2780. DOI: 10.3934/mbe.2020151 [SCIE]

3. **Phung Cong Phi Khanh**, Kieu Thi Nguyen, Duc-Nghia Tran, Dinh-Chinh Nguyen, Trung Hoang Quang, Thang Van Nguyen, Duc-Tan Tran*, "*Classification of Cow's Behaviors Based on 3-DoF Accelerations from Cow's Movements*", International Journal of Electrical and Computer Engineering, ISSN 2088-8708, Vol 9, No 3: June 2019, pp. 1656-1662, DOI: 10.11591/ijece.v9i3.pp.1662-1650 [SCOPUS].

4. **Phùng Công Phi Khanh**, Hoàng Quang Trung, Nguyễn Tiến Anh, Trần Đức Tân, "*Một phương pháp thu nhận và tiền xử lý dữ liệu cảm biến gia tốc ba trục, phục vụ phân loại hành vi của bò*". Tạp chí Nghiên cứu KH&CN quân sự, tháng 8 năm 2018, 340-347.

5. Nguyễn Đình Chinh, **Phùng Công Phi Khanh**, Trần Đức Tân, Lê Vũ Hà, *"Nghiên cứu và thiết kế mô hình hệ thống giám sát hành vi trên bò"*, Kỷ yếu Hội thảo toàn quốc về Điện tử, Truyền thông và Công nghệ thông tin (REV - 2016), Nhà xuất bản công thương, tháng 12 năm 2016, trang 6-19 đến 6-22.

Invention:

6. Trần Đức Tân, Trần Đức Nghĩa, **Phùng Công Phi Khanh**, *Hệ thống phân loại hành vi bò sử dụng cảm biến gia tốc ba trục gắn trên chân và cổ bò*, Sáng chế, số đơn 1-2020-06462, chủ đơn: Trường ĐH Phenikaa, đã có chấp nhận đơn hợp lệ (Ngày chấp nhận đơn: 23/11/2020), số 18194w/QĐ-SHTT.

B. Others

1. Quang-Trung Hoang, **Phung Cong Phi Khanh**, Bui Trung Ninh, Chu Thi Phuong Dung, Duc-Tan Tran. *"Cow Behavior Monitoring Using a Multidimensional Acceleration Sensor and Multiclass SVM"*. International Journal of Machine Learning and Networked Collaborative Engineering. Vol. 02, No. 3, (2018), pp. 110–118, ISSN:2581-3242.

2. **Phung Cong Phi Khanh**, Ton That Long, Nguyen Dinh Chinh, Tran Duc -Tan. *"Performance Evaluation of a Multi-stage Classification for Cow Behavior"*. Telecommunications & Computing (SigTelCom) 2018 2nd International Conference on Recent Advances in Signal Processing, Telecommunications & Computing (SigTelCom), IEEE, 2018, Ho Chi Minh City, Vietnam, pp. 121-125.

Supervisor	**PhD Student**
Date: ……..	Date: ……..
Signature: ……	Signature: ……
Full name: Tran Duc Tan	Full name: Phung Cong Phi Khanh

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