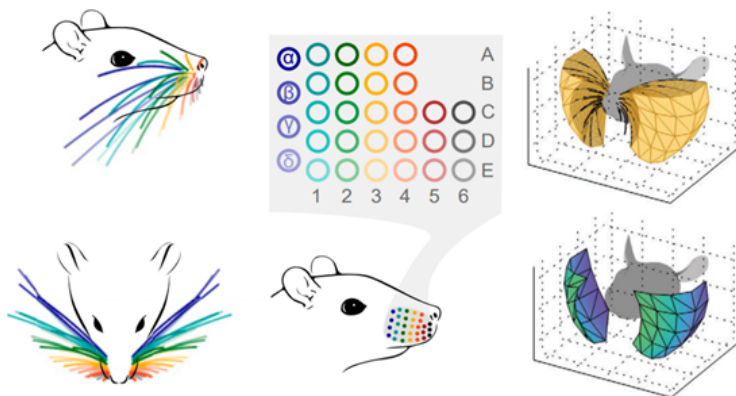


Reconstruction of contacts in search space from a whisker sensor array

Description

Rodents move their vibrissae rhythmically to sense the contact around their near search space and tactually explore the surroundings. As a non-intrusive tactile-based perception solution, these whiskers could typically be used to extract contour and textural feature from objects or actively avoid collisions. They were formed in an array with specific pattern and different curved profile or length. Several previous works [1] focus on building simulation, incorporating realistic morphology of the rat whisker array to predict the time-varying mechanical signal generated at each whisker base. However, it is lack of the use in practical and hard to implement. On the other hand, even though it is important to give accurate contact estimate along the shaft on single whisker, yet it could be quite difficult to acquire it on array since it is too much dense. Based on our current focus on magnetically transduced whiskers [2] and a ready-to-go estimate method on tip-tap, a geometrical surface or encompassed volume formed by vibrissal tips could be a potential new contact expression on whisker's perception.



Tasks

In this project, you will develop communication between single whisker tactile sensor, form an array with pattern on board and explore the application on its geometric-based contact information. Specifically, your tasks will include: **1.** develop a device that supports multiple whisker sensor units in certain pattern, build real-time communication between the sensors' board and computer; **2.** extract geometric-based contact information from whisker array based on vibrissal tips' location and other deflection profile; **3.** (optional) build simulation on whisker array, formulate a sequence of patches based on time-variable signals enabling an end-to-end contour feature detection.

Supervisor:

Prof. Dr.-Ing. Alois Knoll

Advisor:

 Yixuan Dang M.Sc.
Zhenshan Bing Dr.rer.nat.
(Co-adviser)

Type:

MA,SA

Research area:

 tactile sensor, biomimetic
rodent, robotics, non-intrusive
perception

Programming language:

C++ or Python

Requirements:

 High self-motivation and passion
for robots; At least six-month
working time; ROS, Python and
C++ (optional) programming
experiences; Experience on
mechanical structure design.

Language:

English

For more information please contact us:

 E-Mail: yixuan.dang@tum.de

 Internet: www.ce.cit.tum.de/air

[1] A dynamical model for generating synthetic data to quantify active tactile sensing behavior in the rat[J]. Proceedings of the National Academy of Sciences, 2021; [2] A magnetically transduced whisker for angular displacement and moment sensing[C]. 2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).