Pre-Assignment 0: PERSONALITY TEST

What is the purpose of this PERMA test?

Taking this survey will help measure several different aspects of your state in terms of your feeling of well-being. This information is helpful for the organizers of the CDIO Academy. Your team for the CDIO Academy will be made based on the results of this test. Our goal is to build teams whose members have a diverse combination of personalities that will help you complete tasks more efficiently. The data that we collect from your test results will also be helpful for our future research.

Important: You won't be able to view your test results after you close the webpage, so please print a copy of your test results before closing it. Use the copy of your results to answer the following questions.

Interpreting the results of your survey

Directions: Look at the results of your psychological test and write a short answer (100 – 150 words) to the questions. Upload your electronic file (word or pdf) at the website provided.

In which domain(s) did you score highest? Based on your survey results, which job do you think you would be best at? Why?

> Jobs: group leader
> problem solving
> communicating with people from other cultures
> organization
> technical design (CAD etc.)
> presentation design
> oral presentation

Pre-Assignment 1: INTRODUCTION

The use of drones is considered for various purposes such as transportation of goods, surveying of areas that are too dangerous or difficult for humans to access, and inspection of social infrastructure. Although utilizing drones is expected to bring various benefits, problems such as accidents and infringement of privacy must be considered. In this assignment, investigate all issues or problems related to drones regarding the laws, uses of drones, and general technical problems in drone operation.

Search for any problems related to the use of drones in your own country or around the world. What are the problems? Usage problems, technical problems, design problems, etc.)?

Directions: List the problems with short descriptions in the A4 format. Upload your electronic file (word or pdf) at the website provided.

This assignment will be useful for the team activity, so we encourage you to investigate the problems in detail for your reference.

Pre-Assignment 2: TECHNOLOGICAL

Designing an object carrying drone requires a wide variety of mechanical, design, and control engineering knowledge. For example, the following topics are relevant:

*Aerodynamics
*Link mechanism, Degree of freedom
*Kinematics, Dynamics, Jacobian matrix
*Motor specification (torque, rotation speed, energy)
*Friction

Figure 1 illustrates a simple example of a hand pinching an object. Equation (1) must be satisfied to hold the object:

$$mg < N_1\mu_1\sin\theta_1 - N_1\cos\theta_1 + N_2\mu_2\sin\theta_2 - N_2\cos\theta_2 \text{ (1)}$$

μ_1, μ_2: Friction coefficient
N_1, N_2: Normal force
m: Mass of the object
g: Gravitational acceleration

In this mechanism, two motors always need to generate torque to get enough N_1 and N_2 and keep consuming energy.

Propose and explain an alternative mechanism for pinching an object with lower torque/energy. You can make a simple model (by cardboard, wood, etc.), test it, and take a photo or a video (optional).

Directions: Summarize the solution in the document. Photos or videos can be inserted or separately provided. Upload your electronic file (word or pdf) at the website provided.
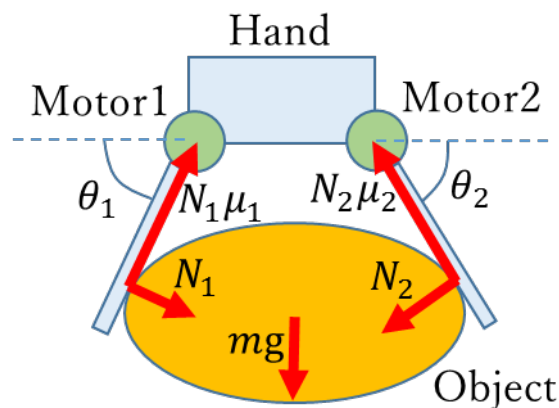

Fig. 1 Simple example of a hand pinching

Pre-Assignment 5: ETHICS

This assignment will provide you with an opportunity to imagine the ethical problems that come with the development of drones.

Technology has always changed our society and our lives. For example, cars made it possible to travel long distances and changed the distribution system of goods. Because of cars, even if we live in the suburbs, we can easily travel into cities. Likewise, even if we live in remote places, we can have goods delivered to our house.

What about in the case of drones? What specific changes will the development of drones bring to society and our lives?

Answer the question, presenting concrete examples.

Directions: Write an answer (300 – 400 words) to the questions. Upload your electronic file (word or pdf) at the website provided.