UBC Mechanical Engineering
Capstone Design Project Proposal

Project Title: Adapted Paddleboard Paddle Effort Assist System

Contact: Eric Molendyk: eric@tetrasociety.org

Background Information:

Stand-Up Paddleboarding is a relatively recently developed sport that has gained popularity. The Tetra Society through the BC Mobility Opportunities Society provides outdoor sport opportunities for people who have limited mobility through programs such as the paddling centre, which is in its 4th year of operation. BCMOS wants to expand and improve the accessibility of its paddleboard program so that more of the persons who are currently not able to paddleboard independently and provided an opportunity to do so for enjoyment and exercise. Last year Mech4-5 developed a working prototype so you will have the opportunity to work off what they created and very closely with very experienced Tetra volunteer David Spears who has also made this a passion project.

The existing program uses a standard paddleboard equipped with a seat and a conventional hand-held paddle. Users with poorer grip strength or limited range of motion effectively cannot use this system.

Please view these links

https://www.youtube.com/watch?v=-hay_vjK3Dw

https://www.youtube.com/watch?v=epr_T60V-Xo

https://www.youtube.com/watch?v=K25W_zS706c

The advent of low-cost load and stability sensors and high performance controls and actuators have made assisted electric bicycles available where users can adjust the degree of assistance provided. There may provide an opportunity to develop systems that provide weaker paddlers with appropriate assistance for independently propelling the paddleboard via a system that helps to hold and move the paddle. Persons who have reduced ability could benefit from a paddling system that they could use without having to do the traditional motion of a side to side paddling stroke. It would be great if you could take the current design done by last year's students and develop it so that those with limited hand function would only have to do one paddle stroke but the paddle board would move forward using a power assist kind of like paddling 3 to 1. For one stroke the paddleboard moves 3 strides forward. In this scenario still gets the much needed exercise and still feels fully physically engaged with the activity to the best of their ability but gets some assistance preventing them from being over-tired.

Project Main Objective(s):

To provide a power assisted paddling opportunity whereby the participant could still get some physical exercise but with a power-assist to more easily move the paddle through the water.

Project Main Deliverable(s):

- Design, build and demonstrate a prototype of the system including user interface. You can use the prototype designed by last year's students as a starting point.
- Ensure that the system is compatible with or replaces the function of existing adaptations.
- Ideally, ensure that the system works for an inclusive range of users including persons with: tetraplegia (with upper limb mobility), hemiplegia, occasional spasticity, poorly-directed motor function
- Ensure that any necessary safety features are included.
- Ensure that the system is minimally obtrusive – ideally, the system should make the user appear like any other paddleboard user.
- It is preferable if the solution is a removable add-on to a standard paddleboard rather than a custom-built paddleboard.
- Ensure that the cost of an assembled system is less than or up to $500

Project Milestones:

- Feasibility investigation completed Oct. 15, 2020
- Conceptual designs/mockup presentation to Tetra November 30, 2020
- Demonstration of functional unit March 15, 2021
- Delivery of design documentation and recommendation report April 10, 2021

Resources Available from the Customer:

Working in partnership with Tetra clients and staff throughout the course of the project. Mentoring from experienced Tetra engineers (volunteers) throughout the course of the project. Access to adaptive devices / equipment.

Contact Information:

Proposed By: Eric Molendyk, National Coordinator

Company Name: Tetra Society of North America
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Company Phone: 604-688-6464 x 117
Company Website: tetrasociety.org
Date: August 20, 2020

Organization Profile:

Type (i.e. start-up, non-profit, government, etc.) & Sector of activity: Non-profit organization providing volunteer-created, customized assistive devices to people with physical disabilities.

Size (number of employees at the local site): Tetra is an affiliated society of the Sam Sullivan Disability Foundation. Among the in program development and implementation, administration, funds development and communications only one of the 9 staff members is dedicated to Tetra on a full-time basis.

Tetra operates 30 chapters across Canada and is supported by approximately 30 part-time contractors and by as many as 200 volunteers (chapter coordinators and engineers, technicians, etc.)

Primary contact persons for the students throughout the project:

1. Eric Molendyk (National Coordinator)
2. David Fong (Director of Operations)
3. Ruby Ng (Tetra Executive Director)