Department of
MECHANICAL ENGINEERING
COLLEGE OF ENGINEERING | THE UNIVERISTY OF UTAH

Tetra Fisher

Spencer Howes, Emily Kemker, Tyler Scott, Taylor Thorpe, Valesca Wall
Project Advisor: Dr. Merryweather

HEALTH
UNIVERSITY OF UTAH

Introduction

The Tetra Fisher is an assistive fishing device designed for individuals with tetraplegia or limited mobility who experience acute impairment of motor functionality. The Tetra Fisher strives to maximize patient independence and encourages outdoor recreation to promote health and wellness.

Problem Statement

Limited mobility prevents patients from operating a normal fishing rod. The assistive fishing device must be customized to their specific needs to reduce the amount of outside assistance required to operate the device. An interface must be developed that is easy to use and facilitates maximum autonomy of the user. Portability and setup of the device are constant concerns for patients, therefore, a compact simplistic design compatible with a user in a wheelchair is required.

Project Scope

In Scope Objectives:
- User safety
- Universal control system
- Aim/cast/reel fishing line
- Versatile for various fishing techniques

Out of scope:
- Multi-input methods
- Wheelchair mount
- Bait hook
- Remove fish

Design & Manufacturing

Casting
Casting is accomplished via a pneumatic chamber through which a fishing bobber is propelled into the water. When the casting is triggered, a solenoid is actuated which releases air into the acrylic barrel.

User Interface
The user interface includes visual, auditory and haptic feedback in the forms of a transflective liquid crystal display (LCD), LED rosette, tone amplifier, and vibration output.

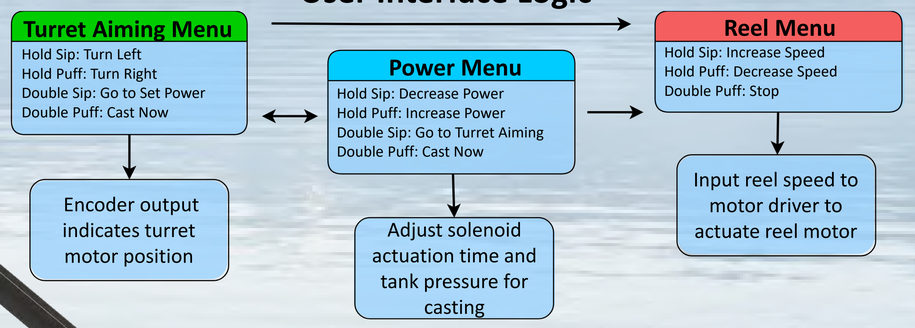
Automated Reeling
Reeling is achieved with a 131:1 gear ratio motor directly connected to a close-faced fishing reel.

User Control
The software is driven by Sip-and-Puff assisted technology, which controls the device with a combination of inhales and exhales into a straw.

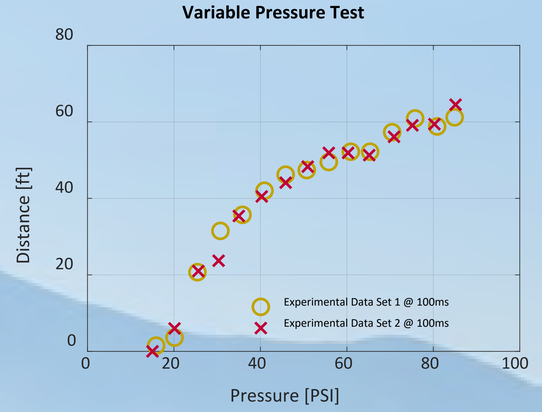
Aiming
Aiming is managed by a motor controller that rotates the device on the x-axis.

Manufacturing
The Tetra Fisher contains 3D printed parts including the flexible rod support, reloading guide, user interface box, and line release mechanism. The reel motor mount and the turret platform were water-jet cut from aluminum 6061-T651.

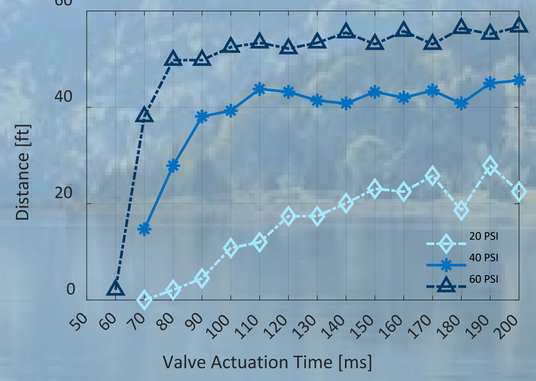
User Interface Logic



Testing & Results



The variable pressure test demonstrated a direct correlation between pressure and casting distance. There were diminishing returns at higher pressures. The maximum distance recorded was 64.5 ft.



The variable valve actuation test illustrates a direct correlation between valve actuation time and casting distance. There were diminishing returns at higher actuation times. The ideal valve actuation time lies between 80 and 100 milliseconds.

Design Specifications

Metric	Units	Marginal	Ideal Value	Actual Value
Reeling Speed	ft/s	0-13.12	>9.84	2.29-3.28
Cast Distance	ft	Max Cast	60.0	64.5
Setup Time	min	<10.0	<5.0	5.0
Mount Rotation	deg	±45˚	±90˚	360˚
Cast Deviation	ft	± 1.0	± 0.5	± 0.91

Funding and support provided by U Health and the Tetra and TRAILS associates including Jeffery Rosenbluth, Ross Imburgia, Ben Ostler, and Thomas Cayias.
This research was funded in part by a grant from the National Science Foundation (#1622741).

National Science Foundation (#1622741).