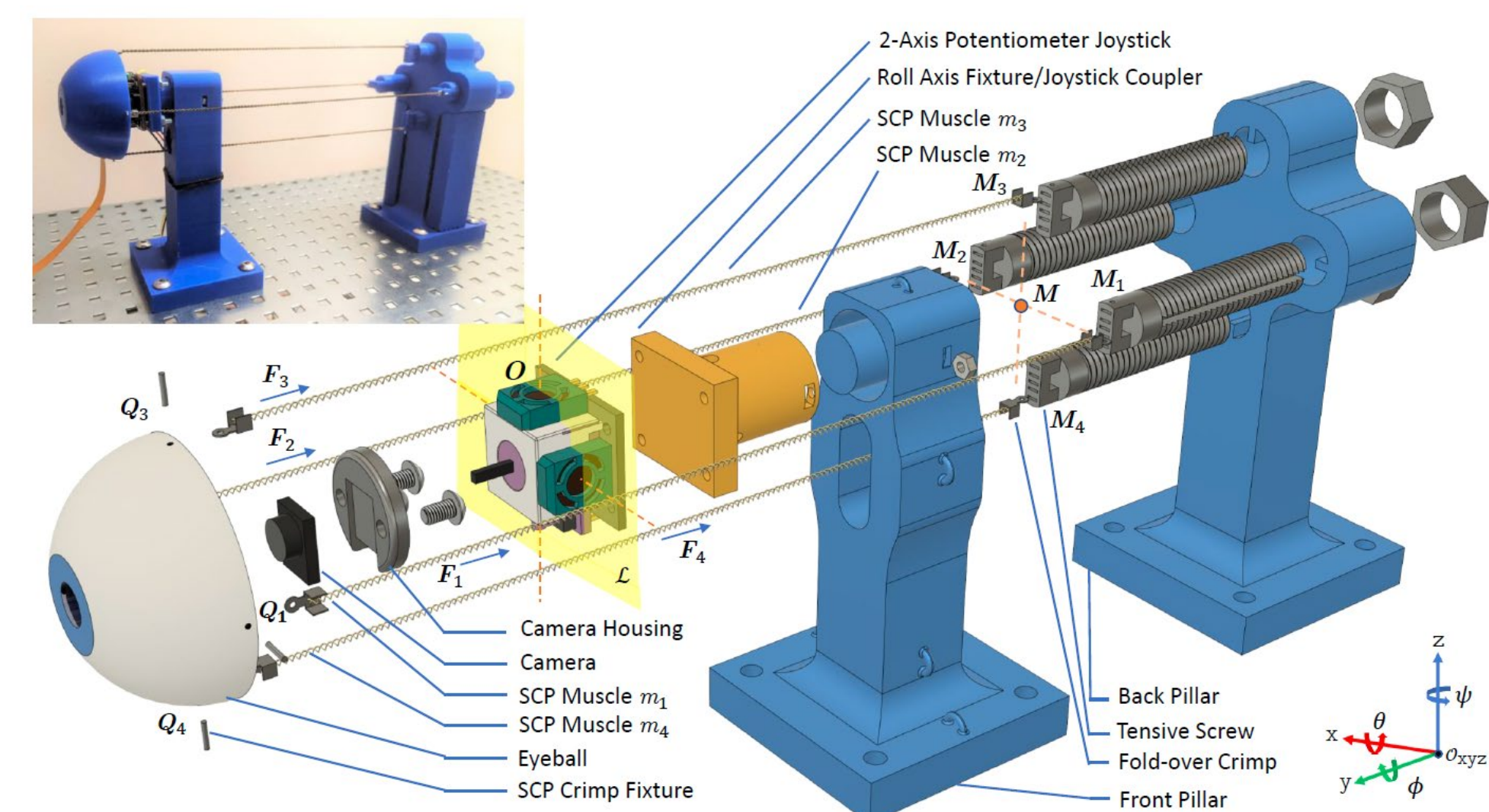


Artificial Muscle Driven Robotic Eyes for Studying Human Eye Movement Control and Disorders

Ningshi Yao and Qi Wei, George Mason University

The proposed research aims to develop an advanced robotic system for studying the complex mechanisms of human vision and binocular eye movement disorders. The system involves the development of artificial muscle driven robotic eyes, an innovative and interdisciplinary approach that involves the fields of robotics, materials science, and vision science.



A robotic eye system that generates realistic eye movement is challenging

- Different types of eye movements with high precision
- Redundancy in control
- Saccades - fastest biological movement
- Coordination of left and right eyes
- Incorporation of normal and abnormal human eye movement data

The knowledge gained from the proposed research has high impact to other CPS systems

- Control principles can be applied to other redundant system
- Identification of biomaterials suitable to mimic human muscle
- Design of an integrated system for both forward and feedback control
- Data driven system

Proposed study has many innovative aspects

- Experiment with artificial muscles that is able to model functions of eye muscles
- Design new neural controllers to accurately coordinate 12 eye muscles
- Demonstrate binocular vision formation

Our research is of interest to several communities

- Robotic researchers and engineers
- Educators who teach eye anatomy and functions and human vision
- Students
- Ophthalmologists

- First robotic eye system that realistically mimic eye muscles and pulleys
- First physical tool to teach functions of oculomotor system
- An excellent system to teach robotics and control

- Training opportunities for grads and undergrads in different fields
- Bridge engineering research with biomedicine
- Inspire more research on neuro-biomechanics of eye movement