

Camera Positioning Mechanism Using Simulated Bio-Vision Actuators (#6056)

Mechanism with abilities similar to the biological eye in acquiring data and movement

Inventors at Georgia Tech have developed a simulated biological gaze control system based on sets of piezoelectric actuators placed on both sides of a camera. Electric signals can cause a number of actuators to contract on either side of the camera, therefore causing the gaze to shift/rotate left/right and in the future also up/down in two degrees of freedom. This solution is simple, quick and accurate, without undesirable gaze-over-or-undershoot.

Benefits/Advantages

- **Accuracy** – Closely replicates the agility of a biological eye
- **Compact** – Economical implementation

Potential Commercial Applications

- Robotic vision
- Visual target acquisition by autonomous or remote controlled weapons with video/heat seeking sensors
- Line of sight/laser tools – surgical “cyber knife”

Background/Context for This Invention

The fascinating ability of the biological vision system to acquire, process and act upon the visual surrounding is, among other factors, supported by the uniquely efficient ability of the biological eye to redirect and focus the gaze to context relevant locations in a random access sequence of fast jumps. These fast jumps are implemented by two sets of muscles operating in couples such that when one is contracting the other is extending. One couple moves the gaze up/down, the other couple left/right. The very fast and very accurate random access scan of the biological eye is closely connected with the high level ability to interpret an image. Each jump is directed to quickly confirm or reject the brain’s hypothesis of the pertinent visual content. The simplicity and agility of the biological eye remains hard to replicate in artificial vision systems. Such gaze-directing agility is desirable in related industrial tasks ranging from target acquisition in defense/surveillance applications to robotic surgery using laser beams.

Professor - Georgia Tech School of Mechanical Engineering

Joshua Andrew Schumer

Graduate Research Assistant - Georgia Tech School of Mechanical Engineering

More Information

U.S. Patent Issued - [8,662,764](#)

Publications

[A Camera Positioner Driven by Muscle-Like Actuation](#), 2012 4th IEEE RAS & EMBS International Conference on Biomedical Robotics and Biomechatronics (BioRob), June 24-27, 2012

[Two-Port Network Models for Compliant Rhomboidal Strain Amplifiers](#), IEEE Transactions on Robotics, September 28, 2012

[Dynamics-Based Motion Deblurring Improves the Performance of Optical Character Recognition During Fast Scanning of a Robotic Eye](#), IEEE/ASME Transactions on Mechatronics, January 9, 2018

[Realization of Smooth Pursuit for a Quantized Compliant Camera Positioning System](#), IEEE Transactions on Robotics, August 8, 2018

[Edge-Preserving Camera Trajectories for Improved Optical Character Recognition on Static Scenes With Text](#), IEEE Robotics and Automation Letters, August 1, 2019

[Camera Trajectory Optimization for Maximizing Optical Character Recognition on Static Scenes with Text](#), IFAC-PapersOnLine, December 15, 2021

For more information about this technology, please visit:

<https://licensing.research.gatech.edu/technology/camera-positioning-mechanism-using-simulated-bio-vision-actuators>

Images: