



## **Department of Computer Science Distinguished Lecture**

### Intelligent 3D Multimedia Displays using Flying Light Specks

**Shahram Ghandeharizadeh**

FLSLab

<https://www.fslab.org>

**Hosted by Vincent Oria**

**Date:** Friday, April 26, 2024

**Coffee:** 11:15 AM – 11:30 AM

**Time:** 11:30 AM – 12:30 PM

**Location:** GITC 1100 (1st floor Lecture Hall)

**Link:** <https://njit.webex.com/njit/j.php?MTID=m8440dafaf1957cb4eaacd631db0424b2>

#### **Abstract:**

A Flying Light Speck, FLS, is a miniature sized drone equipped with one or more light sources to generate different colors and textures with adjustable brightness. Synchronized swarms of FLSs illuminate complex 2D and 3D shapes in a fixed volume, a 3D display. An FLS display may be a cuboid that sits on a table or hangs on a wall, the dashboard of a self-driving vehicle, a room, etc. Its illuminations provide haptic feedback by detecting a user's touch and flying to exert force back. This presentation describes use of an FLS display in two diverse multimedia applications that generate 3D data, entertainment and healthcare. We present an architecture for a 3D FLS display and novel algorithms to localize FLSs to illuminate complex 2D and 3D shapes, compute FLS flight paths to render a motion illumination, use dark standby FLSs to maintain the quality of an illumination in the presence of FLS failures, and STAG as a novel battery charging framework for FLSs.

#### **Bio:**

Shahram Ghandeharizadeh received his Ph.D. degree in Computer Science from the University of Wisconsin, Madison, in 1990. Since then, he has been on the faculty at the University of Southern California. His research interests include design, implementation and evaluation of novel architectures for high performance data intensive applications, multimedia based social networking systems, parallel and cache-augmented database systems. His research team designed and implemented one of the first video-on-demand servers prior to the introduction of DVDs. This system was licensed by Panasonic for research and development purposes. His current efforts with FLS displays is an extension of this prior work to realize a 3D display. His research efforts have been recognized by numerous awards including the NSF Young investigator award, ACM Software Systems award, USC School of Engineering research award, among others.

**Note:** This research is supported in part by the NSF grant IIS-2232382, CloudLab, and CloudBank.

#### **References:**

1. Force-Feedback Through Touch-based Interactions with a Nanocopter. In IEEE Haptics, April 7-10, 2024. With Y. Chen, H. Alimohammadzadeh and H. Culbertson.
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4. Display of 3D Illuminations using Flying Light Specks. In ACM Multimedia, October 10-14, 2022.
5. Holodeck: Immersive 3D Displays Using Swarms of Flying Light Specks. In ACM Multimedia Asia, December 1-3, 2021