

**School of Computer Science and Engineering
Presentation**

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**Autonomous Discovery and Maintenance of Mobile Free-Space-
Optical Links**

ABSTRACT:

Free-Space-Optical (FSO) communication has the potential to play a significant role in future generation wireless networks. It is advantageous in terms of improved spectrum utilization, higher data transfer rate, and lower probability of interception from unwanted sources. FSO communication can provide optical-level wireless communication speeds and can also help solve the wireless capacity problem experienced by the traditional RF-based technologies. Despite these advantages, communications using FSO transceivers require establishment and maintenance of line-of-sight (LOS). We consider autonomous mobile nodes (Unmanned Ground Vehicles or Unmanned Aerial Vehicles), each with one FSO transceiver mounted on a movable head capable of scanning in the horizontal and vertical planes. We propose novel schemes that deal with the problems of automatic discovery, establishment, and maintenance of LOS alignment between these nodes with mechanical steering of the directional FSO transceivers in 2-D and 3-D scenarios. We perform extensive simulations to show the effectiveness of the proposed methods for both neighbor discovery and LOS maintenance. We also present a prototype implementation of such mobile nodes with FSO transceivers. The potency of the neighbor discovery and LOS alignment protocols is evaluated by analyzing the results obtained from both simulations and experiments conducted using the prototype. The results show that, by using such mechanically steerable directional transceivers and the proposed methods, it is possible to establish optical wireless links within practical discovery times and maintain the links in a mobile setting with minimal disruption.