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Space Debris Detection, Tracking and Characterization - SST (1)

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SPACE DEBRIS SURVEILLANCE IN THE UAE: INSIGHTS FROM THE UAEMMN'S FIRST FIVE YEARS OF OPERATION

Abstract

The Sharjah Academy for Astronomy, Space Sciences, and Technology (SAASST), located at the University of Sharjah (UoS) in the United Arab Emirates (UAE), has developed the UAE Meteor Monitoring Network (UAEMMN), as part of the UAE "Space Situational Awareness (SSA)" program, to observe space debris. This network consists of three towers spread over the UAE territory in a triangular configuration to cover the whole UAE sky. At the top of each tower, seventeen cameras scan the sky from sunset to sunrise for any space debris, i.e., natural (meteors) or artificial (rocket boosters or falling satellites). As of 2018, the total number of meteor observations has reached 44,686, with 5,628 double detections (detected by two towers) and 495 triple detections (detected by three towers). These detections are important for determining the trajectory and orbit of meteors, which could help identify if it survived and reached the ground as a meteorite and further aid in identifying its parent body. In addition, our network also detected one rocket booster and three operational satellites in orbit. Given the daily operation of the network for a duration that exceeds 10 hours, it detects numerous moving objects in the sky, be it clouds, the Moon, or any light source. This results in hundreds of false detections per night, especially in one of the stations since it is in a light-polluted area. Machine learning (ML) has been applied to perform data reduction to circumvent this issue. The UAEMMN plays a significant role in compensating for the lack of data regarding meteors' observations in the region. While some networks exist in the Kingdom of Saudi Arabia (KSA) and Oman, data has not yet been sufficiently reported. Also, since the region is known for its vast deserts, having the UAEMMN is essential to possibly pinpointing a meteorite fall. In addition to its scientific value, the UAEMMN is also an educational tool. Through it, undergraduates are trained

on the programs used to capture meteors and get hands-on experience in operating such stations. In turn, this prepares future meteor amateurs who could contribute to meteor observations. To expand the circle and engage the public, we developed a platform called "I Saw A Meteor." This paper will highlight the UAEMMN observations, their usefulness in the UAE SSA program, and associated technological and educational advances.