Error Control Methods for UAV Multimedia Communication

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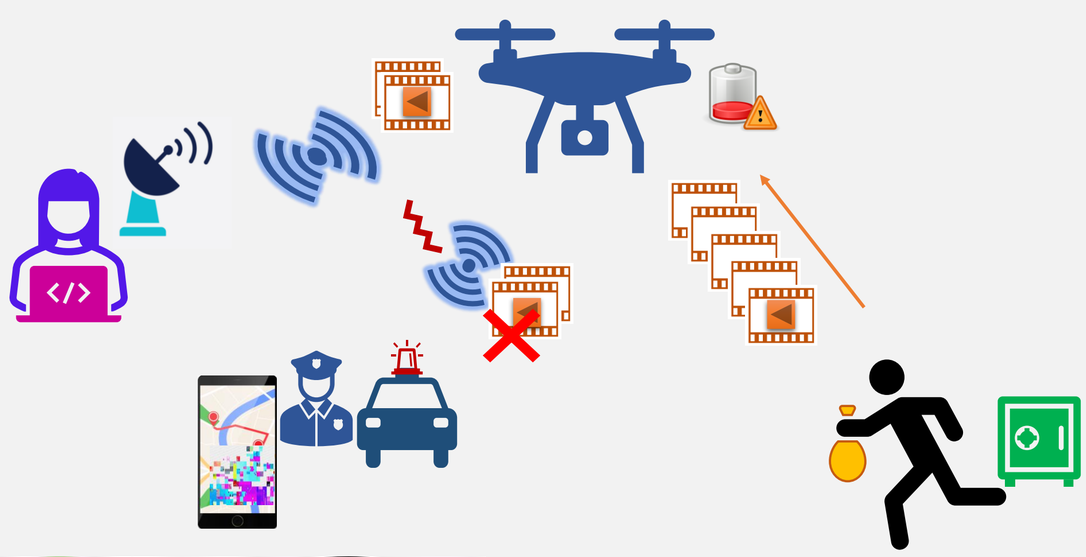
Motivation

- ❖ Reliable streaming Multimedia communications in UAV scenarios
- ❖ Applications such as environment monitoring, precision agriculture, search and rescue operation, target tracking, and firefighting.



- ➢ High mobility
- ➢ High volume of the compressed video stream
- ➢ limited battery

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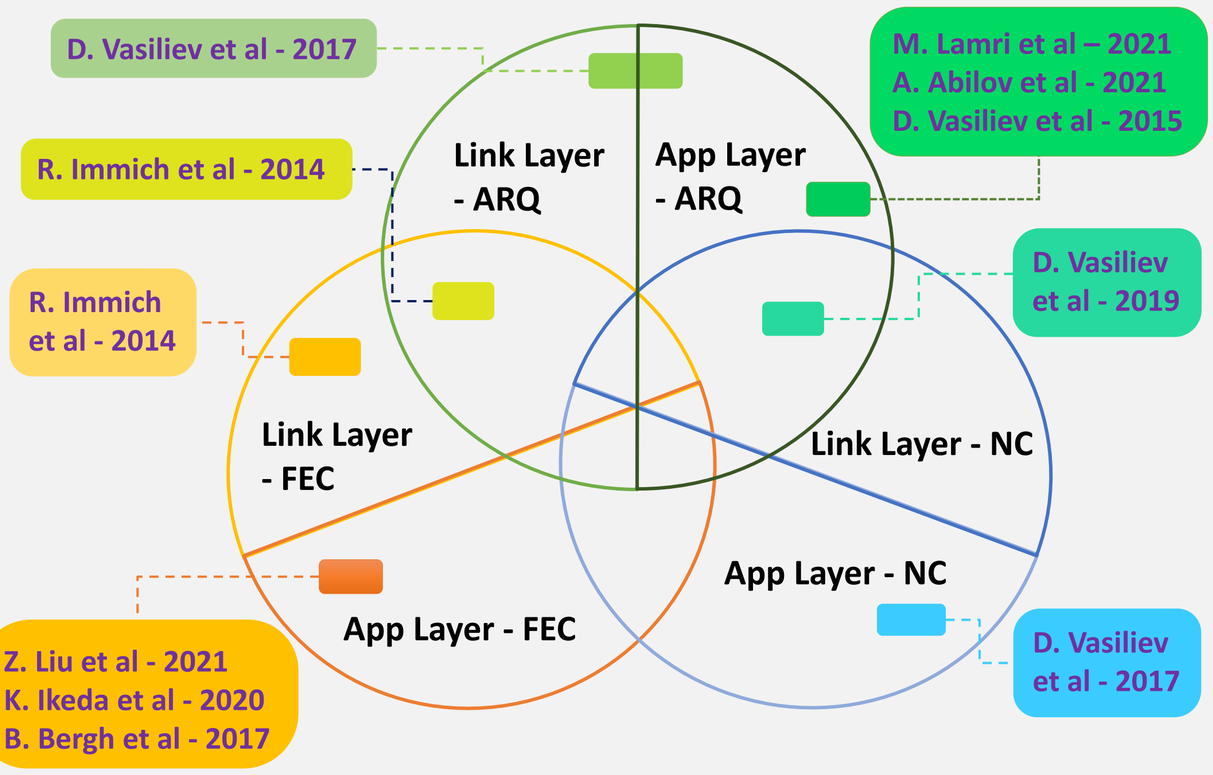
- ➢ High Packet lost rate
- ➢ High Latency
- ➢ High Error rates

Methodologies

- ❖ **Classical Error Control & Recovery Methods**
  - Automatic Repeat Request (ARQ)
  - Forward Error Correction (FEC)
  - Network Coding (NC)
- ❖ **Discrete-event simulation**

Literature review



- ❖ Using static / predefine multiple state for redundancy in FEC.
- ❖ Static number of retransmission in ARQ.
- ❖ Using broadcast mechanism in AP-FEC
- ❖ NC is suitable for relay UAV node.

Research Plan

- ➢ There is no method using **adaptive hybrid AP-ARQ/AP-FEC** in for Multimedia communication on UAV networks.
- ➢ Using a Hybrid AP-ARQ/FEC with dynamic redundancy provide more reliability, less latency, and less energy consumption.
- ➢ Design an algorithm Focus on Cross layer solution for improve reliability:
  - ❖ Dynamic redundancy for FEC in Application layer
    - Determine Redundancy based on Optimization / Machine learning Solutions
  - ❖ Using Hybrid ARQ/FEC in Link Layer
    - Modulation Coding Schemes
  - ❖ Queuing management
  - ❖ Unequal Error Protection on Application and Link Layers
  - ❖ Changing Video Encoding rate during stream
    - Based on the packet lost rate
- ➢ Evaluating on NS3.
- ➢ Suitable for Multi-drone scenarios.
- ➢ Investigating proposed method for cellular network.

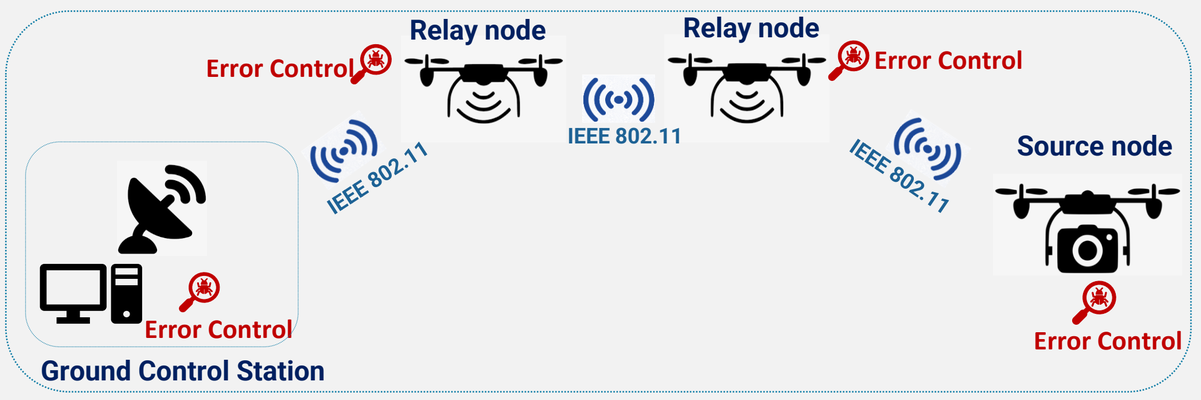


Fig. 1: Envisaged final vision of error control methods for UAV communication

UN SDG challenges

The purpose of this study is to develop a reliable infrastructure for UAV networks.

Real-time video streaming provided by this project opens significant opportunities in a wide range of fields such as:

- ❖ Smart agriculture with monitoring field by drones.
- ❖ Monitoring and protecting jungles and the environment particularly those are unreachable.
- ❖ Smart cities such as mobile surveillance systems by drones.
- ❖ Sustainable communication based on UAVs.
- ❖ Monitoring resource water and avoiding wasting water.

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