UAS-RX: Enabling UAS Fire Ignitions in Complex Firefighting Contexts

IIS-1638099: 2016-2020

University of Nebraska-Lincoln: Detweiler, Bradley, Duncan, Twidwell, Allen, PytlikZillig

Challenge

- Prescribed fire is critical for reducing catastrophic wildfires
- Technology remains stagnant, risky, and expensive

Solution

- UAS-based aerial ignition
- Multi-disciplinary approach

Scientific Impact

- Coordination of UAS with firefighters in harsh environments
- Multi-robot collaboration and debugging

Broader Impact

- Field trials with firefighters
- 3x speed of hand ignition, 100x less $$ than helicopter, >> safety
- UAS Ignition system being commercialized (NSF SBIR)

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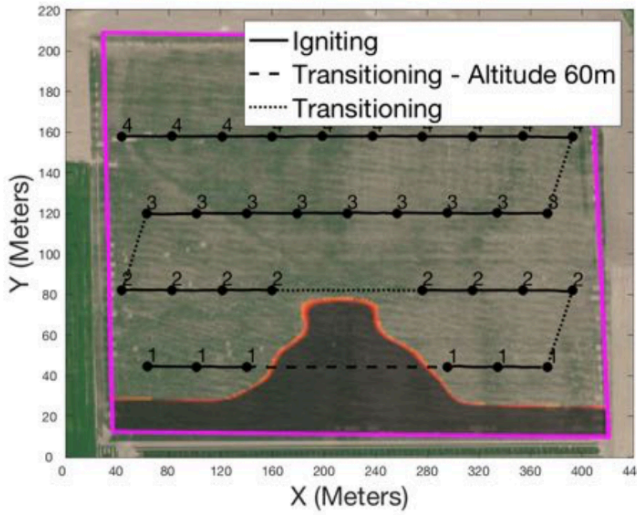
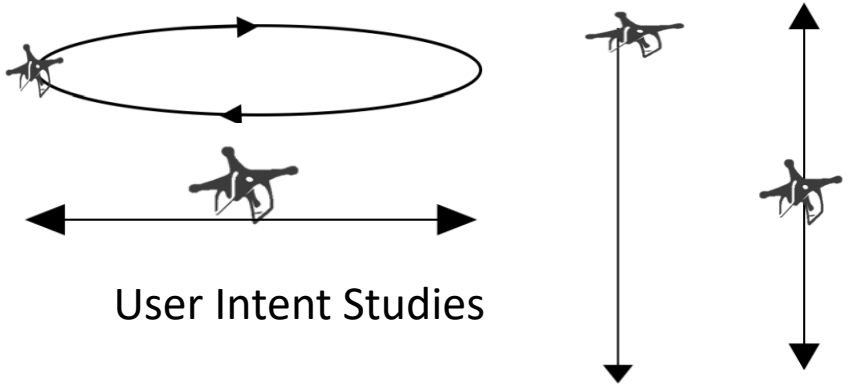
Commercial System (SBIR)

Ignition Planning



User Intent Studies



Field Trials with Firefighters

Software Fault Detection

```
456  // Controller update loop                                   meter-per-second
457  double UpdateControl()   {
...
489      epv = v_ref_x_ - linearSpeedXMps_;
490      epw = w_ref_ - angularSpeedRads_;                        radian-per-second
...
542      double W = summit_xl_trackwidth_;                       meter
543      double y1 = W/2.0;
544      double wx1 = v_ref_x_ - w_ref_ * y1;
meter-per-second
...
546      double q1 = -sqrt( wx1*wx1 + wy1*wy1 );
...
576      frw_vel_msg.data = joint_state_.velocity[frw_vel_] - q1;
...
```

radian-per-second – meter-per-second

Addition of inconsistent units.