

Autonomous Spray Coverage Measurement

Problem statement:

Develop a solution to **autonomously** measure the coverage of an agricultural (liquid) sprayer, such as pesticide and fertilizer spraying systems, **in field conditions**.

Current sprayer coverage estimation schemes include addition of colour dyes in sprays and use of water-sensitive paper which is then manually inspected to estimate coverage and droplet size distribution. Major drawbacks include low-efficiency and accuracy, high measurement complexity (size and placement of sheets play a critical role) and high cost (sheets and manual labour).

Proposed solution(s) must aim to be non-invasive and autonomous:

1. Minimize impact on properties of spray liquid to avoid altering spray characteristics. For simplicity, assume spray has characteristics of water.
2. Minimize impact on crop to avoid damages
3. Automate measurement. For example, if proposed solution uses image processing technologies, contestants are encouraged to explore mounting of appropriate imaging devices, such as RGB, thermal, and spectral sensors, on spraying system for immediate feedback.

Competition Structure:

1. After registration closes, Tata Sons GTIO will organize a webinar to discuss the problem statement and answer any queries from participating teams
2. The competition will take place in 2 rounds.
3. Round 1: to be held in **Oct 2016**
 - a. Each team needs to submit a proposal (not to exceed 3 pages), including comparison with current practice(s)
 - b. A panel of experts will review each proposal to shortlist top (at most) 5 teams
4. Round 2: to be held in **Dec 2016**
 - a. Each team needs to submit a detailed design report (not to exceed 15 pages) in the format of a research paper.
 - b. If required, Tata GTIO can support each contesting team in conducting 1 field pilot to validate the proposed solution but all such requests, along with detailed description of support required, **MUST** be received by GTIO by **Nov 15th, 2016**. Final decision regarding supporting a field pilot will reside with GTIO and will be based on feasibility, solution maturity, and other relevant factors.
 - c. Each team is also encouraged to submit suitable supporting items, including software (image processing algorithms, benchmarking codes and results etc.), proof-of-concept designs, and results, which would strengthen its case
 - d. A panel of experts will review each submission to announce the winners
5. Design metrics: coverage accuracy, droplet size and count statistics, volumetric analysis

Rules:

1. Challenge is open to B Tech and M Tech students of any discipline.
2. A team can comprise no more than 4 members.
3. A team can have no more than one mentor or advisor.
4. Each team needs to nominate a point-of-contact member.
5. Each team needs to submit a proposal in the pre-qualifying round, which will be held in October 2016.
6. Mentor(s) from Tata will be available to guide selected teams during the competition.