2021 NSF CYBER-PHYSICAL SYSTEMS PRINCIPAL INVESTIGATORS' MEETING

Greener Pastures: A Pasture Sanitation Cyber-Physical System for Environmental Enhancement and Animal Monitoring

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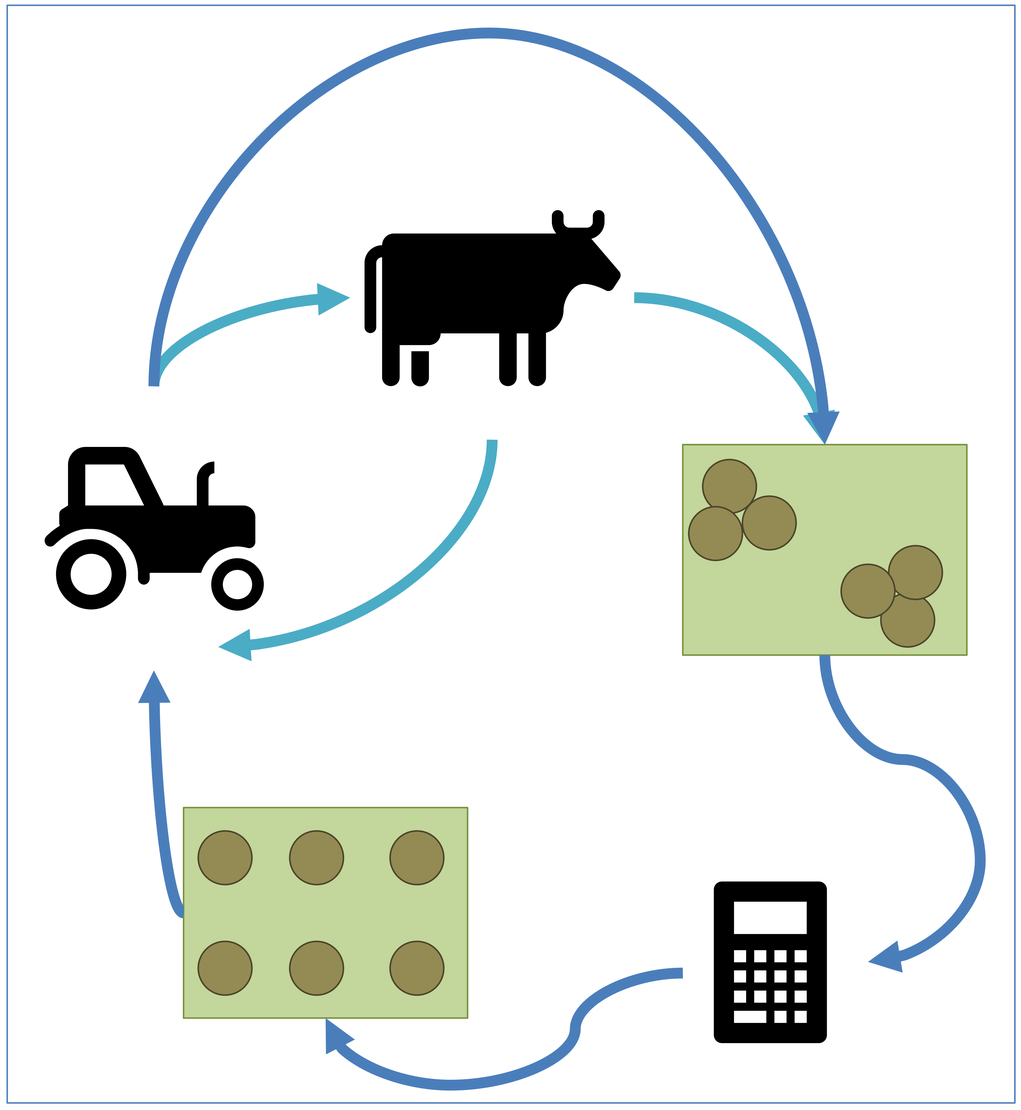
Challenge:

- Manure in pastures can contribute to water quality degradation
- No feasible solutions currently exist to manage pastured manure in a environmentally-friendly and economically-viable manner

Solution:

- An autonomous platform to redistribute manure nutrients within pasture is developed and integrated with sensor networks and hydrology/nutrient models.
- Innovations include: 1) understanding animal/robot interactions; 2) determining specifications for autonomous pasture robotics; and 3) verifying system performance in terms of water quality monitoring.



Graphical representation of CPS for pasture sanitation, environmental enhancement, and animal monitoring.

Scientific Impact:

- Animal/robot interaction data and habituation strategies
- Autonomous monitoring of changes in complex terrain and nutrient dispersion
- Sharing open-source data and CPS-directed robot packages

Broader Impact:

- Reducing manure contamination in water
- Reduced labor expenses and improved pasture productivity
- K-12 outreach to underrepresented minorities
- Engagement of industry stakeholders
- Undergraduate research