# VETERINARY TELEMEDICINE: WEARABLE AND WIRELESS SYSTEMS FOR CATTLE HEALTH ASSESSMENT

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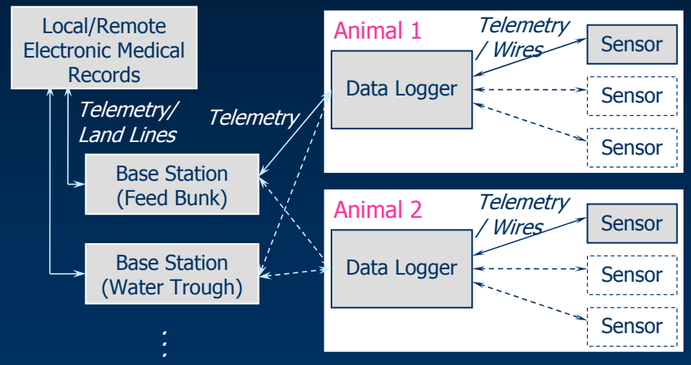
## Project Motivation and Overview

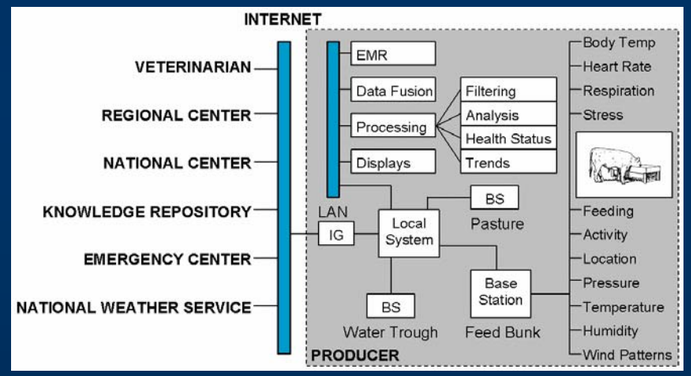
Both ***human*** and ***veterinary*** medicine can benefit from wearable, wireless monitoring technologies that continuously assess patient state of health. The prototype cattle monitoring system presented here is a product of applied research that will enable the veterinary community to react to and predict disease onset and spread. The system employs wearable and ingestible sensors that acquire physiological, activity, and environmental parameters. Data from these sensors are collected by a low-power, embedded data logger worn by an animal. These data are then collated into a stream that can be periodically uploaded wirelessly to a base station and/or handheld computer that comes within close proximity to each animal.

Base stations will exist near cattle congregation points such as feed bunks and watering tanks. Algorithms currently under development will perform preliminary state-of-health analyses on local data prior to uploading feedlot/ranch summary data to regional databases, where these data can then be correlated with weather patterns and herd health information provided by other producers. Substantive findings will be broadcast to veterinary personnel, producers, and government authorities. This approach has the potential to improve the financial stability of the livestock industry while simultaneously raising our level of preparedness for epidemiological disasters, whether from natural or terrorist events.

## Local Data Flow

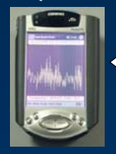



## Information Network




## Early System

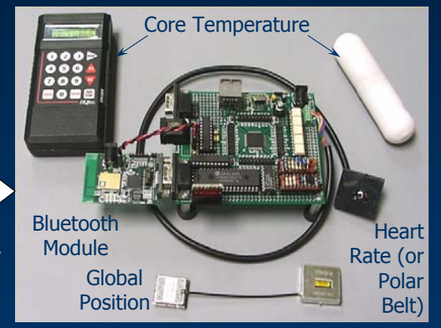
Farmer with Handheld Computer (Base Station)



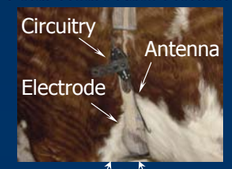
Compaq iPaq PDA

Bluetooth Telemetry Link


3-Axis Accelerometer




Polar Heart Rate Monitor




or

## Novel Sensors

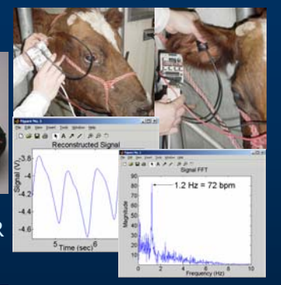
Digital Angel Implantable Temperature Chip


Core Temp and Heart Rate Bolus


Demo Board with RF Tx

Custom Board with Temperature and HR

Light-Based Sensors: Transmittance/Reflectance




## Current System


## Human and Veterinary Telemedicine: Shared Requirements & Challenges

Large-scale telemedicine networks, whether designed for human or animal monitoring environments, share design requirements and implementation barriers. The goal in either scenario is to move from a reactive/episodic care model to a preventative/predictive model, where continuous monitoring and trend analysis constitute a care delivery norm.

### Shared Requirements

- Low-cost wearable & remote sensors
- Health prediction based on trend data
- Subjects: may be unable to interact intelligently with devices
- Surety: security, usability, and reliability

### Technical and Non-Technical Challenges

- Economic feasibility
- Data interpretation
- Battery life
- Packaging
- Patient Compliance
- Sensor selection/placement
- Data integrity
- Usability
- Industry acceptance

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