Socio-technical co-Design for accountable autonomous software

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Autonomous System Software Design Problem
Accountability in Autonomous Software
Artificial Pancreas Example

**Goal:** Maintain blood glucose level within hypo-glycemia and hyper-glycemia range by controlling insulin infusion based on inputs from glucose sensor and user input;

**Designer Req.: Maximize Time in Range** **User Req.: Minimize Time in Post prandial hyper glycemia**

**Phantom Meal** (false carb input to increase insulin): Unwarranted user action due to mismatch in requirements.

**Permissibility of Unwarranted action due to un-accountable controller software.**
ITERATIVE FEEDBACK in SYSTEM DESIGN USING SOCIAL BEHAVIORAL and ECONOMIC (SBE) ASPECTS of USERS
Incorporation of Mental Models

1. Identify Unsafe Actions
2. Identify MM Flaws
3. Identify MM Adaptation Flaws
4. Identified Causal Scenarios

Human in-the-loop

- Human’s Mental Model (MM)
  - MM of the System
    - MM of the System’s Expected Behavior
  - MM of the Environment

Physiological factors (e.g., stress, fatigue)

Actions

Sensors’ information, Displays, and Feedback
- Reports, Media, Manuals, Procedures
- Physical, Social, Legal, Cultural, and Economical Contexts