Infant Stimulus for Apnea of Prematurity

Biofeedback Solutions

Introductions & Titles

[redacted]
Chief Operations Officer
Team Leader
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Chief Engineering Officer
Chief Marketing Officer
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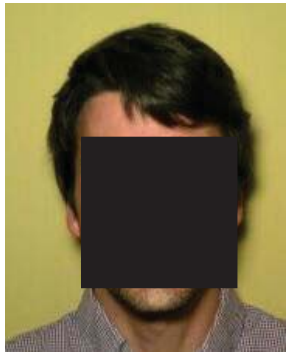

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Chief Research Officer
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Chief Technology Officer
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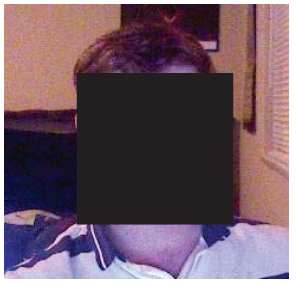


Explanation of Issue

- Apnea: stopped breathing during sleep
- Event also occurs in premature infants
- Current intervention: infant gently stimulated by hand

Background

Proposed solutions

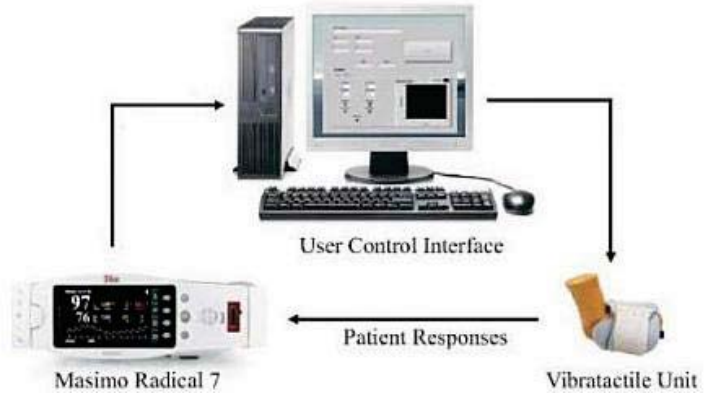


FIG. 1

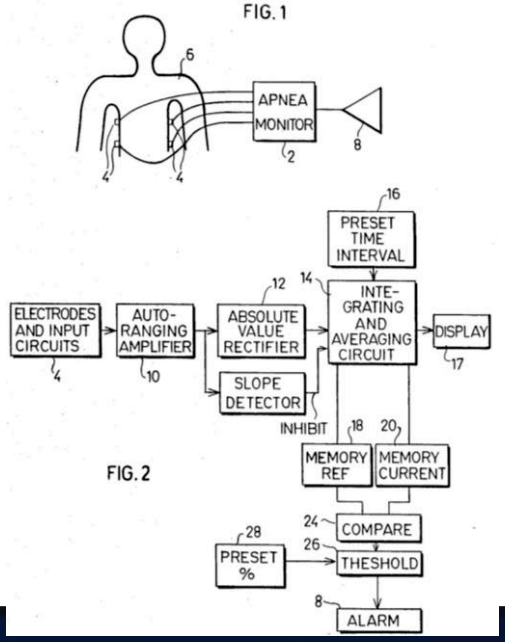


FIG. 2

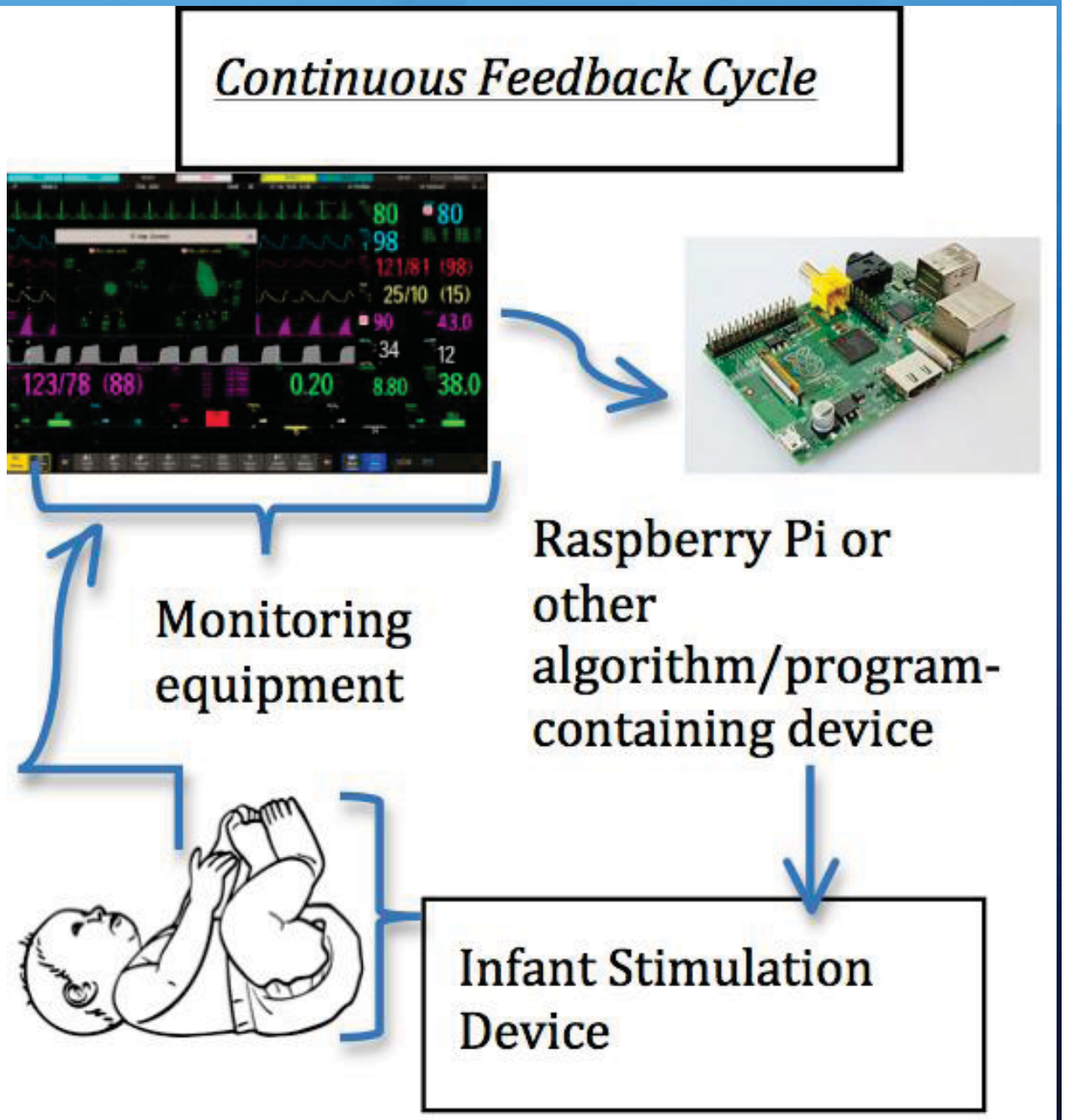
- Stimulation device that is 'stuck' on or comes in direct contact with the infant
- Stimulation device located on infant's foot
- Response to taste/smell and tactile stimulation during apneic episode
- US Patent 5,555,891: Vibrotactile stimulator system for detecting and interrupting apnea in infants
- US Patent 4,630,614: Apnea monitoring apparatus

Stakeholder Requirements

As per [redacted]

- The device must be able to:
  - Quickly detect an apneic episode
  - Quickly respond to a sensed apneic episode
  - *Potentially*: prevent apnea
- Furthermore, the device **must not**:
  - Use electric stimuli
  - Be injurious to the skin of the premature infant
  - Interfere with current equipment/tubing/cords

Graphic of Feedback Loop



Design Input & Tech Spec's

Monitoring Equipment:

- Accurately & constantly monitor an output that is capable of differentiating apnea versus no apnea
- Be non-invasive of cabling, tubing, and other equipment currently in use

Raspberry Pi/Microcomputer:

- Detect apnea versus no apnea by instantaneously analyzing the data that is output to it by the monitoring equipment
- Signal the stimulation device in the event that apnea is detected

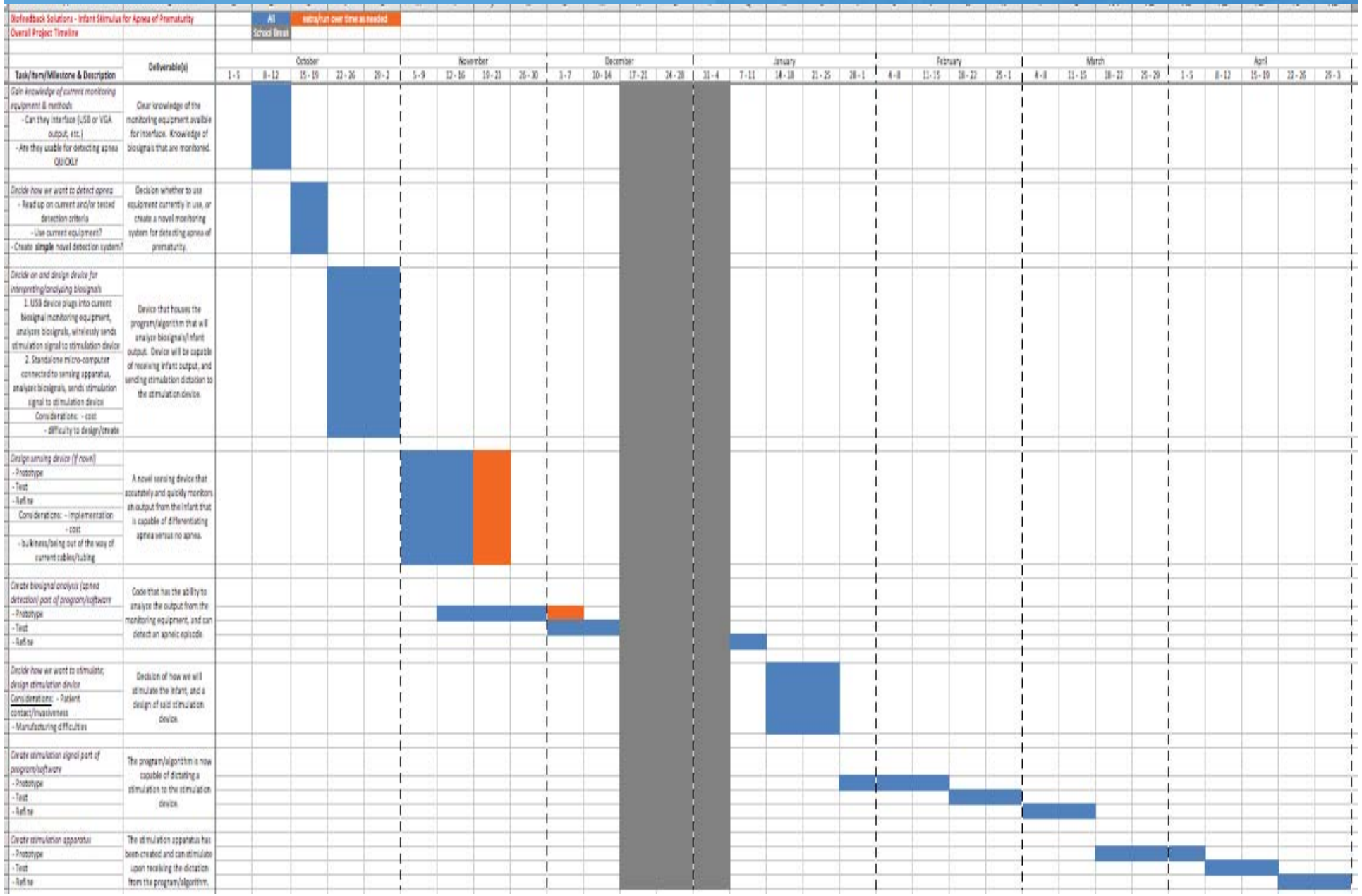
Stimulation Device:

- Non-invasive as possible
- Effective stimulation so as to disrupt apneic episode

Societal Implications & Concerns

- Cost of device, given medical equipment product requirements
  - Specialized materials (hydrogels, etc.)
- Safety concerns, given product application
- FDA and IRB approval
- Testing the device will be a challenge
- Manufacturing concerns include sterilization of patient-contacting parts
- Sustainability: some parts disposable, some re-usable
- Scope: implementation at UT Graduate School of Medicine

Overall Project Timeline



QUESTIONS?