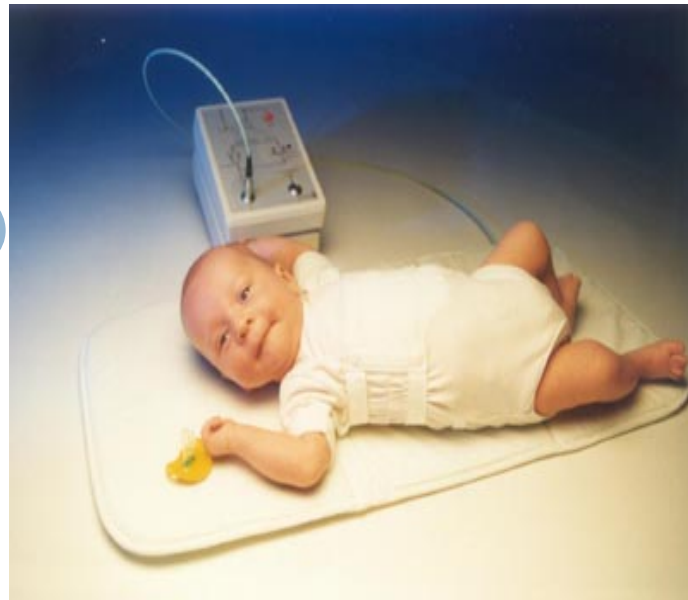


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# MULTI-SENSOR INFANT MONITORING SYSTEM



## Look Instruments:

Kemal Simpson

Lindelle Davis

Opeoluwa Aladekomo

Obafemi Otelaja

# BACKGROUND:

- Sudden Infant Death Syndrome (SIDS):
  - Sudden unexplained death of an infant
- Industry affected: Biomedical
- Technology: Infant Monitoring System
  - Detect multiple vital signs
  - Alerts caregiver to reduce the onset of SIDS
- Customer: Caregivers of infants



# PROBLEM FORMULATION

- NIH/NICHHD reports that “Back-to-bed” program significantly reduces SIDS occurrence by 50% since 1990
  - “Back-to-bed” program - designed primarily to stress that babies should be put to sleep on their back
- Existing monitoring technologies:
  - Detect singular vital signs
  - Limited in scope
- Multi-sensing monitor system required
- A working knowledge of various subjects



# PROBLEM FORMULATION (CONT'D)

- Specifications

- Mountable in typical bedroom
- Work in light or dark room
- Not excessively heavy, providing ease of travel

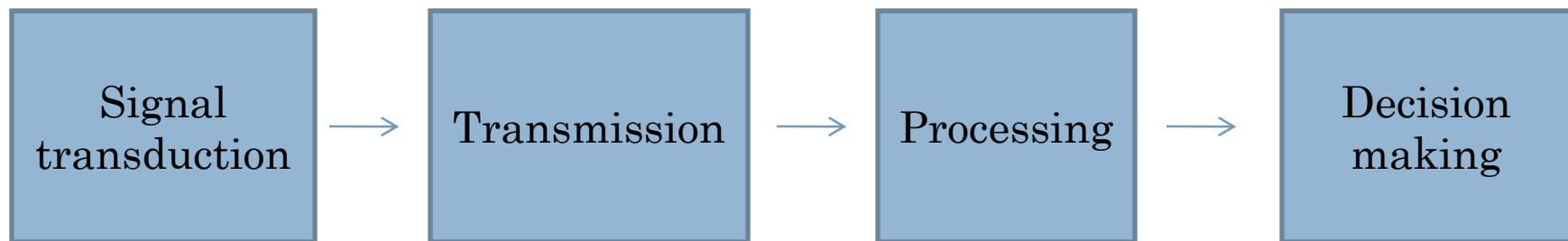
- Regulations

- Must meet the definition of a medical device in section 201(h) of the Federal Food Drug & Cosmetic (FD&C) Act
- Must adhere to the Food and Drug Administration (FDA) regulation of a maximum level of 0.5  $\mu\text{g}/\text{mL}$  for lead content products intended for use by infants and children

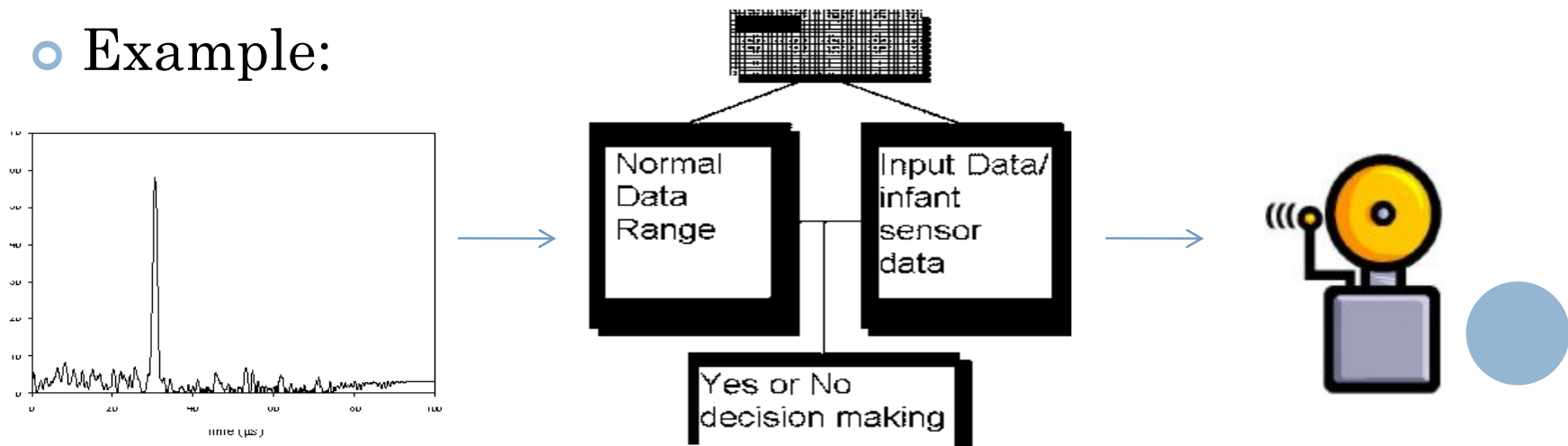


# SOLUTION APPROACHES

- System level schematics



- Example:



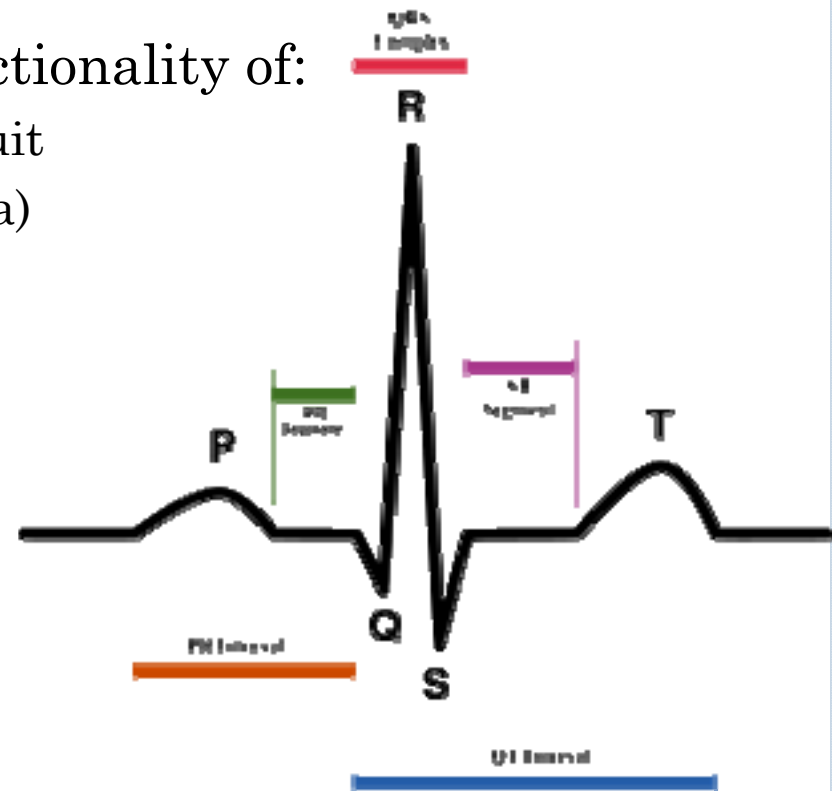
# MAJOR SOLUTION

- PAT Baby Suit (Hybrid)

- Merges the concepts and functionality of:
  - Integrated Multi-senor Baby Suit
  - PAA(Position, Alternans, Apnea) Infant Monitoring System

- Monitors:

- Position – Pressure sensors
- Temperature
- Heart Alternans
  - Electrodes → Input unit → Processor → Comparator



# ALTERNATE SOLUTIONS

- Integrated Multi-senor Baby Suit
  - Monitors:
    - Position, Temperature, Pulse
- Position Monitoring Mattress
  - Monitors:
    - Position, Pulse, Air quality, Noise monitor, Video Surveillance
- PAA(Position, Alternans, Apnea) Infant Monitoring System
  - Monitors:
    - Position, Heart alternans, Apnea



# DELIVERABLES & VERIFICATION PLAN

## ○ Deliverables

- Wearable prototype with detachable sensors
- Mannequin baby
- Crib-side mountable alerting device
- User manual
- Virtual instrumentation with Labview programming

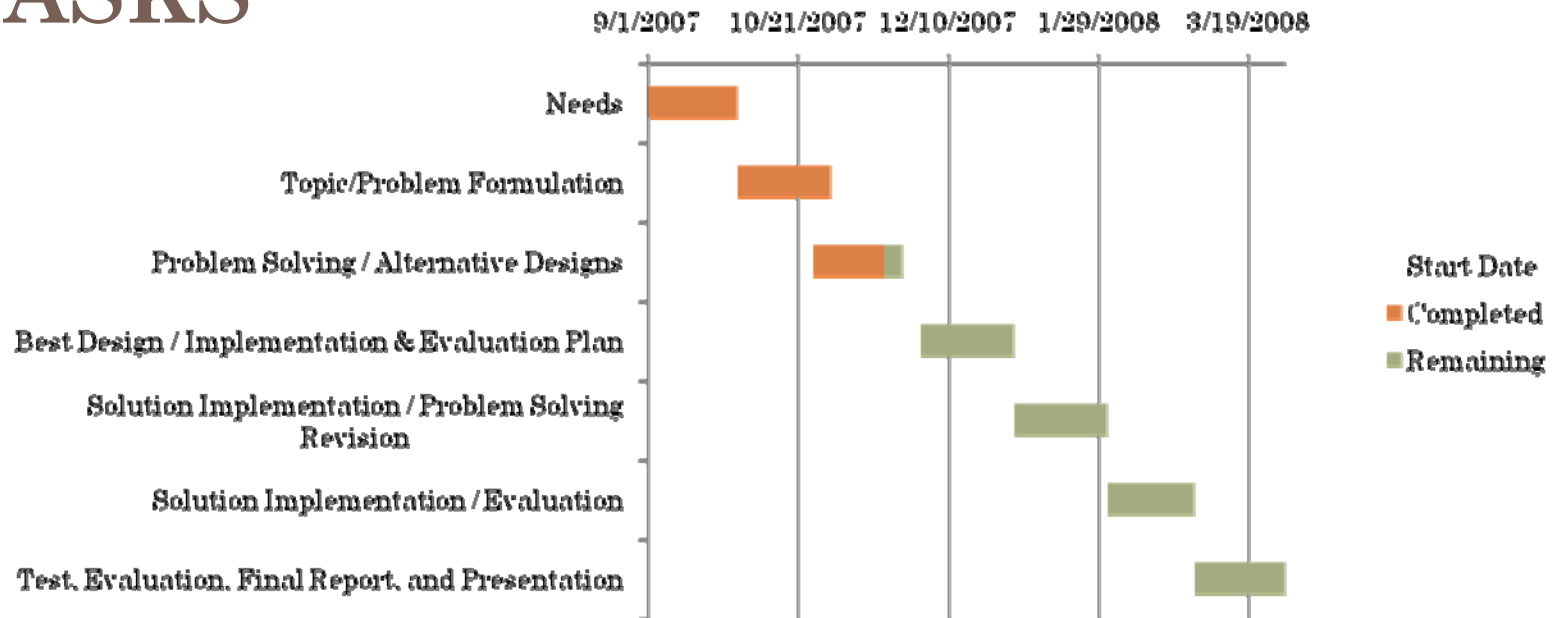
## ○ Verification plan

- Turn the mannequin infant over to test pressure sensors
- Heat the mannequin infant to emulate a rise in temperature to test
- Emulate heart beat by pressing on the mannequin infant





# PROJECT MANAGEMENT & TASKS



- Research
  - SIDS
  - Patents for baby monitoring
  - Ways to alert caregiver
- Development
  - Pressure switch circuit
  - Heart Alternans monitor
  - Temperature monitor
- Test and analysis

- Implementation
  - Establish a method of alerting
  - Determine optimal positions of sensors
  - Attach sensors
- Production
  - Prototype
  - Alerting device
  - manual



# COSTS AND RESOURCES

## ○ Resources:

- Dr. Anderson
- Internet
- National Institute of Health (Journals, statistics, etc.)
- United States Patents & Trademark Office

## ○ Costs:

- Microprocessor - \$300
  - ECG Electrodes - \$27.50
  - Alarm Buzzer - \$74.50
  - Comparator - \$20.00
  - Pressure Sensor Switches - \$100
  - Miscellaneous costs - \$100
  - Labview – free
  - Labview toolkits - \$1250
- Total Budget - \$1872.00



# CONCLUSION

- Our system will effectively detect multiple signals and vital signs associated with the onset of SIDS
- We hope to thoroughly evaluate and test our solution implementation for our design according to the projected timeline
- Completion of final design and deliverables, including prototype by end of March 2008
- Upon project proposal review, we are willing to make any necessary changes to our design and/or functional requirements

