Expert Anesthesiology
Monitoring System

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Introduction

- Summary.
- Background.
- Project Goals.
Summary

- Purpose
- Unique device
- System Components
- Existing Products
- Budget analysis
- Goal
Background

• Ideal Product Application:
• Development of an anesthesiology monitoring system that will more accurately judge the consciousness of patients to maintain amnesia, analgesia, and immobility.

• Make a monitor that will take into account a patient's prior resistance, acute and chronic disease states, age, weight, gender, exercise tolerance, medication usage, and habits such as smoking, drug, and alcohol use.

• The BIS monitoring system was suggested as a preliminary design.
Project Goals

• **Use LabVIEW to Create:**
  - A clear visual display of Vital Signs of the Patient.
  - Use Patient information for analysis of consciousness.
    - prior resistance, acute and chronic disease states, age, weight, gender, exercise tolerance, medication usage, and habits such as smoking, drug and alcohol use.
  - Primary Development of Level of Consciousness:
    • Electroencephalogram (EEG)
    • Electrocardiograph (ECG)
    • Volumetric Capnography
    • Blood Pressure
Project Goals (cont.)

• The program should be reliable and easily understood.
• The settings should be easily manipulated.
• Front panel should display:
  – Clear graphs with:
    • Corresponding numerical values
    • Appropriate clear labels
  – Clean and purposeful appearance
Old versus New

• Previous designed Anesthesia Monitoring Systems
  – Advantages and Disadvantages

• Our design ideas
  – Advantages and Disadvantages
BIS Vista

Advantages:
• Clear
• Accurate
• Alarm

Disadvantages:
• Only uses EEG
• Patients vary which makes the range change.
Snapp II

Advantages:
- Clear
- Accurate
- Alarm
- Battery Life Monitor
- Small

Disadvantages:
- Only uses EEG
- Patients vary which makes the range change.
- Not as clear or easy to use as the BIS model
New (LabVI EW)
Advantages & Disadvantages

Advantages:
- Clear Readable Graphs.
- Use of patient’s information.
- Use of EEG, ECG, Volumetric Capnography, and blood pressure.
- Clear large numerical displays of exactly what needs to be controlled.
- Range changes dependant on patient’s information.
- Alarms for each separate reading.
- A graph that pulls all the information together into one clear level of consciousness.
- Alarm that will set off when the patient leaves acceptable range of consciousness.
Advantages & Disadvantages (cont.)

Disadvantages:

• More difficult program design.
• More involved, therefore more can go wrong.
Basis For Design Techniques

- ECG
- EEG
- Blood Pressure
- Volumetric Capnography
Electrocardiograph (ECG)

- Record electrical impulses that control the heart contractions
- P, QRS, and T waves
- Changes in the amplitude and intervals between waves are dependent variables such as physical activity or a resting state.
- Filtering: 0.05Hz to 40/100/150Hz
Electroencephalography (EEG)

- EEGs measures the electrical activity within the brain.
- Fluctuations depend on a wide range of stimuli.
- Alpha, Beta, Delta and Theta waves
- Filtering: 0.5Hz to 35-70Hz & a band stop filter at 60Hz
- BIS
Blood Pressure

- Measures the Systolic and Diastolic pressures.
- Provides a way to determine trends in the patient’s blood pressure.
- Displays an ambulatory blood pressure measurement graph (ABPM).
- When anesthesia is administered their blood pressure will fluctuate accordingly, giving anesthesiologists a better understanding of how the patient is reacting to the anesthesia.
Volumetric Capnography

• Measures the respired carbon dioxide concentration and the total gas volume exhaled.

• Provides early detection of ventilatory depression and respiratory failure
## Budget

<table>
<thead>
<tr>
<th>Pricing for Hardware and Software Components</th>
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<tbody>
<tr>
<td><strong>EEG Sensor</strong></td>
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<tr>
<td><strong>Volumetric Capnography sensor</strong></td>
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<tr>
<td><strong>Wiring</strong></td>
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<tr>
<td><strong>Blood Pressure Cuff</strong></td>
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<tr>
<td><strong>LCD Touch Screen</strong></td>
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<tr>
<td><strong>Electrodes</strong></td>
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<tr>
<td><strong>Total</strong></td>
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</tbody>
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Budget (cont.)

- Testing supplies
- Sensors for connecting LabVIEW to the subjects.
Conclusion

- **Expert Anesthesiology Monitoring System**
  - This design should help to maintain the amnesia, analgesia, and immobility of the patient with accuracy
  - Custom design
  - Clear and Accurate
  - Easy and Functional
  - Estimated project cost = $650

- Utilizing biomedical engineering principles to enhance the abilities and analysis skills of the anesthesiologist in the operating room that will give a new level of judgment capability.
Thank You!

Any Questions?