„Social Interactions of Artificial Ventilated Patients in Intensive Care – an Example of a Monitoring System”

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Short Resume

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• M. Sc. in Management and Engineering with the major Materials and Engineering from the Leuphana University Lüneburg (Germany)

• B. Eng. in Engineering with the major automation and minor in business administration from the Leuphana University Lüneburg (Germany)
Introduction

- Demographic change leads to an increasing number of older people [1]

- Rising probability for the need of care of aging people [1]

- 6.6 out of 100,000 people in Europe are mechanically ventilated at home [1]

- 2.59 million people in need of long-term care were treated outpatient in 2017 in Germany [2]

Number of severely handicapped ventilated patients in Germany [3]
Introduction

• Few studies evaluated the quality of life of ventilated patients [4], [5]
• No studies dealt with the social life of the respiratory patients, but with the safety of patients [6], [7]
• Most mechanically ventilated patients spend most of their time in bed [7]
• Connection of social interaction and nursing procedures are described as a strong link [8]
• Uncertainty of the embeddedness of intensively cared patients in the family context [9]
Method - Measurement Setup

- RGB-D sensor: Microsoft Kinect v2
- Pos. 1 during process of suction via tracheostomy tube
- Pos. 1 and 2 during process of tracheostomy tube change
Method - Measurement Setup

• Two professional therapists for artificial ventilation

• Process of suction via a tracheostomy tube and the change of the tracheostomy tube on a training mannequin

• The process of suction via tracheostomy tube was also performed on a proband

<table>
<thead>
<tr>
<th>Procedure</th>
<th>RGB-D pos</th>
<th>Subject</th>
<th>Caregivers</th>
<th>Repetitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suction</td>
<td>1</td>
<td>Mannequin</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Suction</td>
<td>1</td>
<td>Proband</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Change</td>
<td>2</td>
<td>Mannequin</td>
<td>1 and 2</td>
<td>5</td>
</tr>
</tbody>
</table>

29 min and 45 seconds of data within 17 videos
Method - Measurement Setup

• Analyzed regarding:

  • Which patterns represent typical nursing procedures?
  • Which patterns represent social interaction?
Results – Suction via Tracheostomy Tube
Example:
Suction via Tracheostomy Tube
Results – Suction via Tracheostomy Tube

• Camera position 1

• Caregiver 1

- During hand disinfection caregivers faced the training mannequin, were averted of the proband

- Being averted suggest no evidence of social interactions, based on RGB-D data

<table>
<thead>
<tr>
<th>Type of patient</th>
<th>Orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Averted</td>
</tr>
<tr>
<td>Training mannequin</td>
<td>1</td>
</tr>
<tr>
<td>Proband</td>
<td>4</td>
</tr>
</tbody>
</table>
Results – Tracheostomy Tube Change
• *For further observations:*
  • Camera position 2 should be used
  • Real patients should be monitored
  • Sound pressure should be measured
  • Identify possibilities to replace the used RGB-D sensor → IR-array sensor
Concept – Multi Sensor System

System start → Start trigger → Deactivation → Min. 2 person in room

Min. 2 person in room → True → Stop data collection

Min. 2 person in room → False → Deactivation

Deactivation → True → Stop data collection

Deactivation → False → Get data frame

Get data frame → True → Save data frame

Save data frame → True → Stop data collection
Concept – Multi Sensor System
Conclusion

• Demographic change with the increasing number of older people and the higher probability of older people to be in need of care and intensive ambulate care

• Differentiation between handling a training mannequin and a proband

• Novel concept to collect information about social interactions is presented

• Multi sensor system combines RGB-D, IR-array and sound pressure data with the quantity of social interactions in a highly sensitive environment
Reference


Reference
