

lumila

# Bot-to-Bot Conversations — automated testing for empathetic interaction in healthcare

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February, 2018

Péter Boda

enabling seamless &  
empathetic interaction for  
parental engagement

“ design.ist

AI

design

# Multimodal Interaction

Speech Recognition

Acoustics

## Spoken Dialogue Systems

Natural Language Understanding

Dialogue Management

Mobile Wireless Sensor Systems

**SensorPlanet**

# Experience Design

Usability  
Human Factors

## User Experience Interaction Design

Visualization

## Design-Driven AI solutions

# Patient Experience

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**AI solutions**



[lumila.us](https://lumila.us)

supporting parents of premature babies,  
with the power of AI,  
for better parental engagement and shared decision making  
with the care team

[the Tool](#)[the Study](#)

we all have a journey

A person is running through shallow water, likely at sunset or sunrise, as indicated by the warm, golden light. The person is in the foreground, slightly to the right, and is captured in a dynamic pose, splashing water. The background shows a calm sea and a distant, hazy horizon. The overall mood is one of perseverance and effort.

..... but some of us might got an  
extra mile or two to fight



# Design Study: parents' lived experience

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**Figure 1:** Kangaroo-care given to a premature child by the father. *(Permission to use the above picture was received from the child and the father.)*

## **Prematurity in numbers:**

- 15 million premature babies born globally per year,
- 90% of babies are saved in wealthy parts of the world,
- 90% mortality rate in developing countries,
- premature birth rate 18% in some parts of Africa and Asia, in Scandinavia as low as 5-8%,
- the global average is 11%,
- in the U.S. 500,000 premature births per year, or 11% of all the live births.

Source: WHO report [11].

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## Family-Integrated Care

**Origin:** In 1979 a new "humane" model of care was implemented by the Tallinn Children's Hospital in Estonia, allowing and encouraging mothers to stay with their babies 24/7 due to a shortage of nurses. Except for administering medication, examinations and medical care by the nurses, the mothers learned to care for their premature babies.

### Benefits:

- improvement in weight gain,
- reduction in infections,
- reduction in the length of NICU stay,
- reduction in nurse workload,
- may reduce parental stress due to better opportunity in developing confidence,
- biological ties between the mother and the infant are preserved; no physical, psychological, emotional separation.

Source: Levin's Estonian Baby-Friendly NICU [5]

# Design Study: parents' lived experience

## Designing Multimodal Tools for Parents of Premature Babies

### Péter Pál Boda

Department of Signal  
Processing and Acoustics,  
Aalto University  
Otakaari 5 A, FI-02150  
Espoo, Finland  
peter.boda@aalto.fi

### Akos Vetek

Tampere Unit for  
Computer-Human Interaction,  
School of Information Sciences,  
University of Tampere  
Kanslerinrinne 1, FI-33014  
Tampere, Finland  
akos.vetek@uta.fi

### Abstract

The paper describes our efforts in designing and developing a tool for supporting parents of premature babies during their critical time in a Neonatal Intensive Care Unit (NICU). The identification of the needs are described from the parents' perspective, and supporting evidence is presented from the babies' development point of view. The paper presents our research on identifying the lived experience of parents of premature babies through a large scale international study. The findings of the study are detailed to show how they led to the experience design criteria of a multimodal journaling tool. The paper closes with an overview of ongoing research of practical solutions to multimodal interfaces, the implementation of multimodal integration techniques, and a discussion on the generalization of the multimodal journaling tool to the larger context of patient engagement applications.

### Author Keywords

User-centered design, experience design, multimodal interfaces, parents, healthcare, neonatal care, patient engagement

### ACM Classification Keywords

H.5.2 [Information Interfaces and Presentation]: User Interfaces, User-centered design

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	Parents	%
U.S.A.	133	45
Finland	46	15
Hungary	40	13
Norway	19	6
Ireland	18	6
Australia	10	3

**Table 1:** The top 6 countries of the respondent parents, representing ca. 90% of the 298 participants.

### User Study Aspects

*General:* country, mother or father answering, level of prematurity (gestational age and weight in ranges, e.g. 25-30 weeks, 1-2 lb).

*Communication:* type and frequency of interaction with the care team and beyond.

*Information access:* dealing with the amount and type of information, metrics.

*Coping:* managing emotionally, mentally, physically.

*Engagement:* extent being involved in the daily care.

*Tools:* methods used to follow the baby's development,

*Experience:* initial reaction with three adjectives, reaction when left NICU for home.

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May 7–12, 2016, San Jose, CA, USA.

Shock overwhelmed worried  
Fear birth nervous stressed anxious Scared  
Frightened concerned lost hours Scary happy felt  
guilt Disbelief staff feel nicu preparing angry Excited  
experience relief upset labor make numb pregnancy Terrified  
sad husband die son hopeful helpless  
baby hospital confused

Excited happy  
scared proud told NICU anxious relieved  
nervous overwhelmed finally apprehensive monitor tired great day night Elation  
worried oxygen change care life Fear Relief  
hopeful grateful sad state time feel  
home hospital son back Joy  
baby

# Design Study findings

- better **communication** with the care team (60%)
- **real time** flow of information (52%),
- better way to **understand** the baby's development, the most important metrics, and the “**big picture**” (51%)
- tools must be **easy to use, seamless interaction**
- important role of **peers**

# the product



## Progress

At the core of the solution is the **visualization** of the baby's development.

Visualization that is easy to understand and seamless to interact with.

Accessible across languages and across platforms.



## Knowledge

The amount of information, especially in the early days, can be just simply overwhelming.

Learning new terms, **understanding** developmental issues and their impact should be grasped at a glance. Becoming more knowledgeable is reassuring.



## Sharing

Parents should also have access to the best experts: to **parents** who already did the journey with a premie.

Sharing their **lived experience** with new parents of premies provides much-needed **peer support**.



## Analytics

How can we measure we are on the right track?

On the long run, **big data of tiny fighters** will show how parents' involvement in the care makes a difference.

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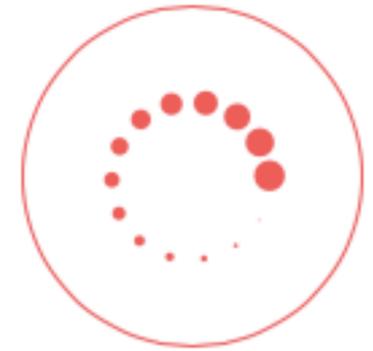
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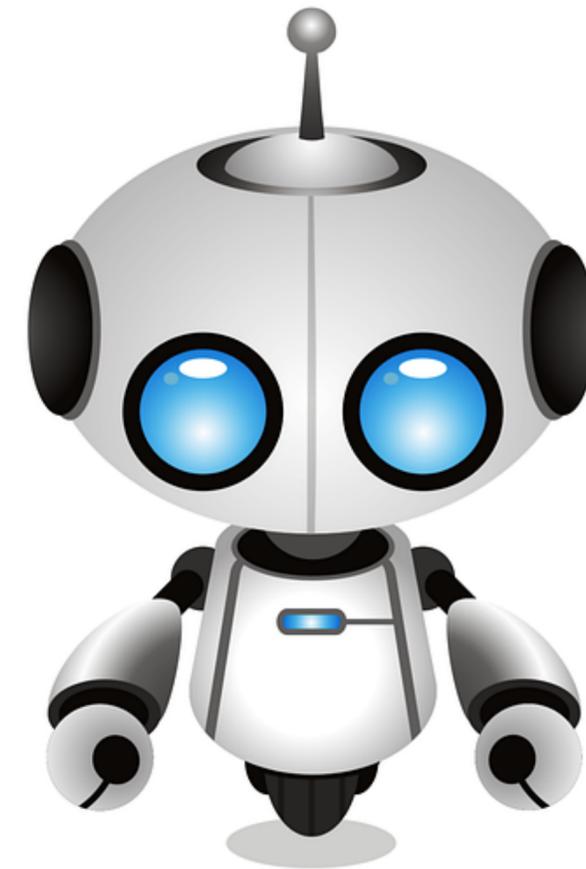
# How to . . . .

- interact with parents under stress?
- provide **empathetic interaction**? —> support & engagement
- build a system that can interact with a wide variety of **mentally, emotionally** and/or **physically exhausted users**?
- let parents care for their babies in the NICU and not be distracted?

# Conversational interaction development

- no data available for stressful inputs
- our solution: simulate wide variety of users .... with bots
- the ultimate use of bots for automation: bots training bots
- probabilistic Natural Language Generation

# Bot-to-Bot conversation for testing



# Task to solve — work in progress

- through language generation (content, wording), various personalities can be simulated
- e.g. politeness, verbosity, being under stress, etc.
- **state machines** with “personalized” transitional probabilities
- why? how data could boost the process?



thank you

[peter@lumila.us](mailto:peter@lumila.us)