

Lessons Learned in Modeling Complex Dialog for Productive Encounters

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Robert Hubal

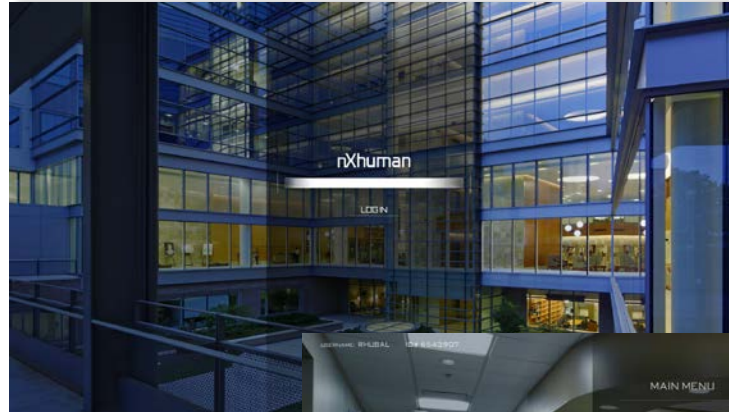
- Research interests center on the **intelligent use of technology** (e.g., simulation, natural language, sensors) to better teach and assess complex knowledge and evolving skills
 - Developing increasingly realistic virtual patients
 - Studying cost-effective methods for teaching and assessment of technical as well as sociocognitive skills
 - Studying cost-effective methods for improving technical and sociocognitive skills within clinical practice



- Presenter
- Project
- {topic 1}
- {topic 2}
- {topic 3}
- Future work

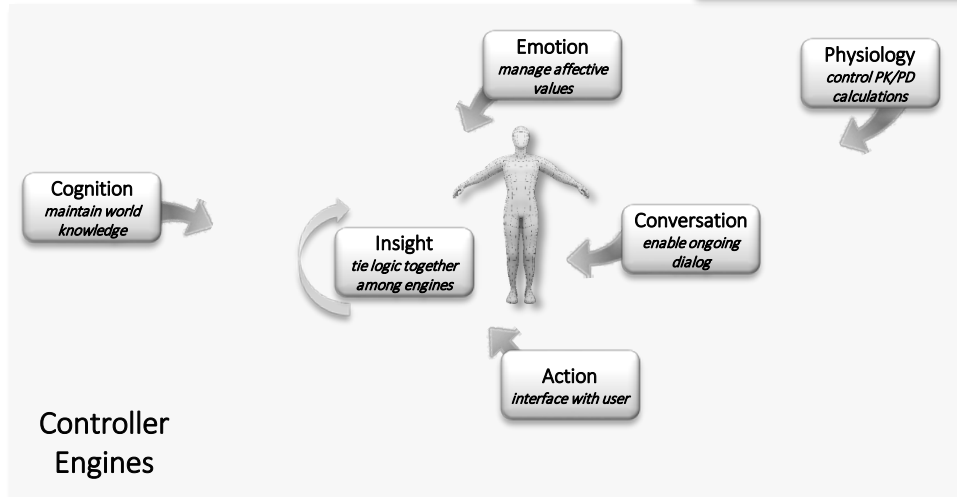
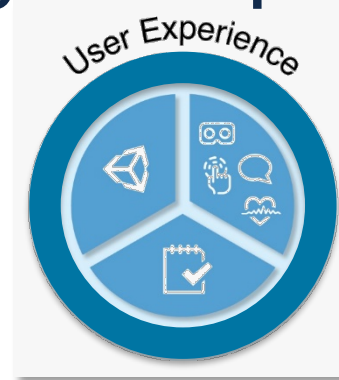
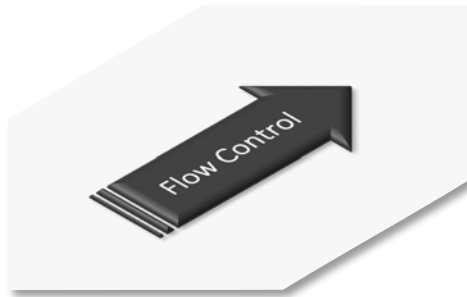
nXhuman Project Purpose

- Repeated practice in clinical decision making
- Prepare students prior to seeing first patients
- Exercise 'process of care'



- Purpose
- Objectives
- Activities
- User Experience
- Character
- Components

nXhuman Underlying Components



- Purpose
- Objectives
- Activities
- User Experience
- Character
- Components

Ethan Burch

- Background in game design
- Simulation fellow at VA
 - Health care knowledge
- Games for change



Kevin Lanzo

- Pharmacy student – UNC Eshelman School of Pharmacy
- Simulation in CIPS
- Future industry pharmacist



Video of Simone

Design, Testing

- How we didn't think of most responses
 - Even the SME went off script
- Refining the script to better fit dialogue and vice versa

Who is this for?

<u>Pharmacy Year</u>	<u>Skill level</u>
Year 1	Inexperienced
Year 2	Aware of shortcomings
Year 3	Patient care experts

- Pharmacy practical exams: a standard model for learning

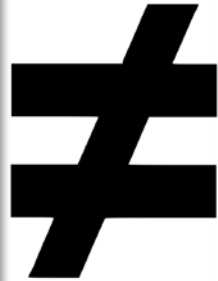
Perpetual battle



Either broccoli
flavored ice cream
-or-
Well balanced meal +
dessert

Problem

Average pharmacy
student



Focus group

UI & Feedback

- Tailored to users
- Difficulty and degree of feedback between skill levels in users
- What types of feedbacks – focus groups

73% TRUST

DIABETES

| Family Medical History

| Diet and Weight loss

| Current Medications

so if you've got any ideas...

on how I can get rid of that, I'm all ears.

I hear that alot. Okay...weight loss...

anything else?

I'm a little concerned about diabetes, too.

It runs in my family, ...

so I'd like to check that out.

Okay.

Let's start there. Your A1c levels are not good.

Absolutely. Who in your family had diabetes?

In a bit. Let's talk about something else first.

TRUST

PROGRESS

The Challenge

- Natural, unscripted, complete clinician-patient conversation

The Reality

- NLP still experimental as game mechanic
- Recent tools make the job easier

Watson



Watson

- Verbs and nouns – intents and entities
- (James has lovely images we can pilfer)

Watson pt. 2

- Challenge – Watson is a smart chat app
- Our usage: novel purpose

Scenarios

- Adapting written dialog to Watson

Scenarios

- Differences between implementing scenarios 1, 2, 7 & preceptor

Dialog complexity

- Dialog meant for much more complexity

Building off each other's work

- Game design approach:

- Intents/entities/language

- Pharmacy approach:

- Pharmacy terminology
- Flow of conversation

Building off each other's work



[Workspaces](#) / Encounter_2 / BuildIntents **Entities** Dialog Content Catalog**My entities** System entities

Add entity



<input type="checkbox"/> Entity (11) ▼	Values	Modified ▼
<input type="checkbox"/> @conversation_topics		2 months ago
<input type="checkbox"/> @diet	vegetables, fruit, caffeine, meal, fast food, lunch, snacks, junk food, breakfast, soda, diet, alcohol	2 months ago
<input type="checkbox"/> @exercise	walk, rock climbing, exercise, yoga, run	2 months ago
<input type="checkbox"/> @family	family medical history, mother, grandmother, aunt, dad	a month ago
<input type="checkbox"/> @medication	medications, ibuprofen, prescription, OTC meds, birth control	2 months ago
<input type="checkbox"/> @med_inquiry	timing, side effects, start date, dose	a month ago
<input type="checkbox"/> @patient_concerns	diabetes, breast cancer, weight	2 months ago
<input type="checkbox"/> @personal_info	blood sugar, immunization, job, insurance, Name, address, yourself, birthday, allergies, blood pressure, medical conditions, surg...	a month ago
<input type="checkbox"/> @psychological_state	boredom, stress	2 months ago
<input type="checkbox"/> @smoking	cessation, smoke, pack, tobacco, nicotine replacement therapy, cigarette	2 months ago
<input type="checkbox"/> @spouse_history	living situation, married, partner	2 months ago

Ask about lorazepam
#Ask_lorazepam_vague and @conversation_topics:lorazepam
4 Responses / 2 Context set / Skip user input

Skip user input and evaluate 5 child nodes

lorazepam dose
#Ask_dose or @med_inquiry:dose or \$Ask_dose
1 Response / 0 Context set / Jump to

lorazepam indication
@med_inquiry:indication or \$topic.lor or @med_inquiry:indica...
1 Response / 0 Context set / Skip user input

Skip user input. The first child node will be evaluated next

Patient concern about lorazepam
true
1 Response / 0 Context set / Return allowed

lorazepam start date
#ask_when_initiated or \$ask_when_initiated or @med_inquir...
2 Responses / 0 Context set / Jump to

Ask about lorazepam

Customize



If bot recognizes:

#Ask_lorazepam_vague and @conversation_topics:lorazepam

Then respond with:

1. I take my lorazepam every night.

Add a variation to this response

And finally

Skip user input 5 child nodes will be checked

Playtests

- Challenge with being vague
- Thinking of every possible way to say the same thing
- Author deviated from script

Iterate!

NLP Approach

- 4 stages
 - STT (Watson)
 - NLU (Inky)
 - Generation (SocCog)
 - TTS (Polly)

Lessons Learned

- Intents can be used in more defined...definitions
 - Allows system to identify certain phrases in script more easily
 - BUT users then need to follow script
- Entities should be the differentiator in dialogue
 - In future – generic intents, precise entities
- Watson has several limitations
- Had to simplify due to delay in speech recognition

Plan Forward

- Talk about Ink for time being
- Writing branching narrative
- Reincorporating back into NLP
- Playtesting more & greater frequency

Questions?