



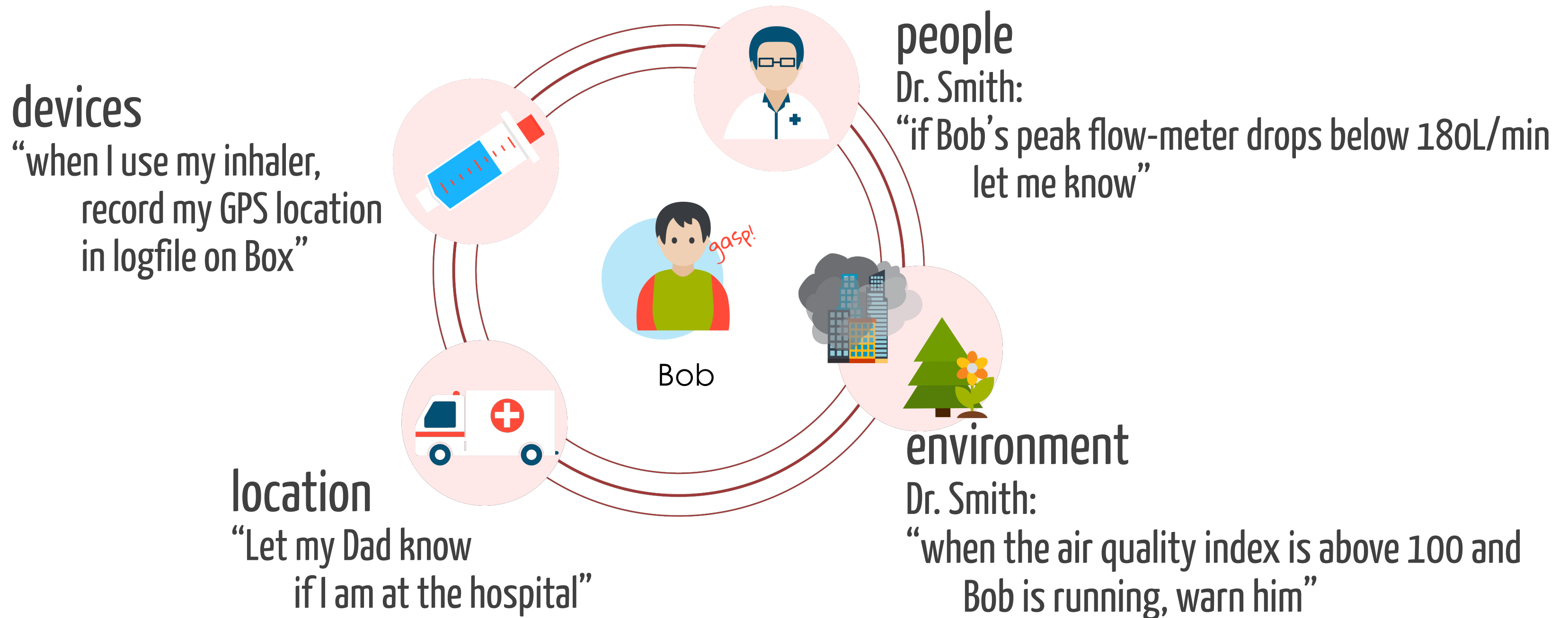
Teaching End-User Programming

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Funded in part by NSF, Alfred P. Sloan Foundation, Stanford Human-centered AI

End-User NL Programming



Event-Triggered ThingTalk




“When I use my inhaler,
get my GPS location, if it is not home,
write it to logfile in Box.”

```
monitor @Inhaler-use(),  
=> @GPS(), location <> “home”  
=> @Box-write(file=“logfile”, data=location)
```

Thingpedia: Encyclopedia of Things



- **Interoperability**
 - API signatures + corresponding NL
 - Not just intents
- **Open repository**

	Natural Language	API Signatures
WHEN	@Stanford tweets	Monitor (@home_timeline(), ...) author=="Stanford")
GET	tweets matching "#Cardinal"	search(...), contains (hashtag, ...)
DO	tweet "Stanford won!"	post (status)

ThingTalk Grammar

WHEN [**FILTERS**] → **GET** [**FILTERS**] → **DO**

FILTERS: =, <, >, <=, >=, <>, contains, starts with, ends with

When I use my inhaler, get my location, save them to Dropbox.

If I get taken to a hospital, let my dad know.

When the air quality index is above 100, and I am running, send me an SMS.

If my heart rate is above 130, and I am not running, remind me to take a deep breath.

End-User Programming

- Can consumers/professionals automate their tasks on the web?
- Very few APIs are available
- Very difficult to work with APIs
- Define skills by demonstration
- Event driven computations, conditionals, iterations, function calls.

[start]

a couple cooks

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Seasoned Salt Recipe

RECIPES - ESSENTIAL RECIPES -

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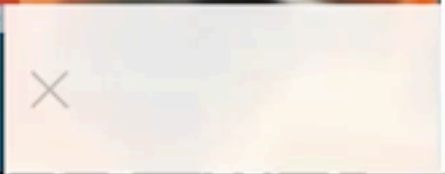
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Multimodal Programming Language: WebTalk

VASH Specification	WebTalk Code
Web primitive: Select and copy “AAPL”	let this := @select(selector = “a.company:nth-child(3)”); (1)
Construct: “Start recording stocks”	function stocks(<i>param</i> : String) { (2)
Web primitive: Open finance.yahoo.com	@load(<i>url</i> = “https://finance.yahoo.com”); (3)
Web primitive: Paste in the search box	@set_input(selector = “input#search”, <i>value</i> = <i>param</i>); (4)
Web primitive: Click Search button	@click(selector = “button[type=submit]”); (5)
Web primitive: Select current price	let this := @select(selector = “span#today-quote”); (6)
Construct: “Return this value”	this ⇒ notify ; (7)
Construct: “Stop recording”	} (8)
Web primitive: Select a stock symbol	let this := @select(selector = “span.symbol:nth-child(1)”); (9)
Construct: “Run stock with this”	this ⇒ stock(this.text); (10)

[Fischer, Campagna, Choi, Lam, 2020]

A Gentle Introduction with Common Idioms

Monitors

- Notify me when the AQI rises above 100
- Notify me when my boy friend tweets
- Notify me when new homework is released
- Notify me when the price of this dress drops
- Notify me when the bitcoin drops to 10,000 USD
- Notify me when the checking account balance drops below \$200.00

Cron jobs

- Get the grades for "Simon" in "X" High School on the 1st of each month
- Get checking balance at the end of each month
- Turn off the phone at 11pm every night
- Reserve a table for 2 at Tamarine for 7pm on Feb 14, 2021 at 12am Dec 14, 2020.

Comparison shopping

- Show me the price of this [dress, air purifier] in [store1, store2, store3]

- Expose users to examples
 - Crowdsource useful commands for people to try
- Once users get the hang, show them how they can DIY

A Potential Schedule

- Start with Monitors
 - A webpage of common examples [3 weeks]
 - Adapt code from thingpedia
 - Experiment on how to teach “DIY” monitors [2 weeks]
 - User study with MTurks and revise [2 weeks]
- Stretch goals: CRON, comparison shopping ...

Why You Should Work on This Project?

- End user programming is the holy grail!
- But changing users' behavior is the hardest thing
 - Needs a good understanding of human psyche
- Let's take the smallest baby step (Lesson 1)
 - Lessons 2, 3, ... will be easier
- All the system components are available!