Intelligent Mobile Agent for Future of First Response*

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Rapid Growing Number and Types of Internet of Things (IoT) Sensors

https://www.youtube.com/watch?v=IBE-DxQwyjw

Body-Worn Sensors

Fixed Sensors

Mobile Sensors



Specialized Hazmat Sensors







First Responder Drone Sensors



* Image source: google.com

AUDREY for JPL DHS Next Generation First Responder (NGFR)



- ★ Keep them safe
- ★ Keep them healthy
- Make IoT simple
- Structure and Unstructured Big Data 🖈 Make communication reliable
 - ★ Turn data into intelligence
 - ★ Support decision making
 - ★ Improve performance
 - ★ Enable collaborations

AUDREY for NGFR Why is this a hard problem?



- ★ Decision Making with Incomplete / Difficult Observations and Communications
- ★ Rule / Policy-based Systems Fail with Real-World Problems
- ★ Model-based Approaches Fail with Complex Problems
- ★ Human-System Interface in High Stress Environments
- ★ Need to Make Predictive Recommendations in Real-time
- ★ Learning with Few Examples
- ★ Collaborate Across Jurisdictions

AUDREY needs to Fuse, Analyze, Reason, Predict, Advice, Learn, Collaborate

AUDREY (Assistant for Understanding Data through Reasoning, Extraction, & sYnthesis)

- AUDREY use bio-inspired Neural Symbolic Processing
 - Mixed neural and symbolic processing by achieving neural processing at symbolic level for higher level cognitive reasoning
- AUDREY leverage human intelligence to achieve better machine intelligence
- AUDREY capabilities:
 - Reasoning and learning new knowledge at the same time
 - Deal with missing or contradictory data
 - Automatically synthesize workflows to answer questions
 - Learn from human and a community of Audrey nodes



The Evolution of AI



Achieves unprecedented levels of reasoning for previously unsolvable problems

* Image source: google.com

Audrey – Artificial General Intelligence Assistant

(Assistant for Understanding Data through Reasoning, Extraction, & sYnthesis)



NGFR Needs:

- Improve First Responder Safety & Performance



Audrey Al Personal Assistant - Process Huge Amount of IoT and Other Data



Audrey Automates Data Analytics

- \star Reads
- \star Thinks like a person
- \star Data Fusion

- ★ Learns
- ★ Uses tools to Solve Problems
- ★ Discover Unknowns

ATAK Audrey Plugin Development (ATAK- Android Team Awareness Kit)

Audrey Plug-in

Live Deployment to Android







Audrey in the Cloud and on ATAK





Physiological Sensors and Patches









JPL



Augmented Reality Display



EPSON BT-300 Augmented Reality Glass

JPL

Wearable Alert and Monitoring System (WAMS)

• The Controller builds upon an Android-based "plug-in" framework to enable on-demand updates to core functionality



- Allows Audrey to download IoT sensor processing software to Audrey Controller based on the discovered sensors
- Reduce communication bandwidth needs from IoT sensors by pushing intelligence to the edge
- Manage communication priorities based on type of traffic (ex. vital signs can take priority over video when bandwidth is limited)
- Enables Audrey to perform limited vital function when communication is not available
- Intelligently manage Comm Hub based on the conditions of the networks
- Manage and maintain ad-hoc networking under highly disruptive environments
- Enables intelligent IoT networking
- Support goal-driven automatically IoT sensor composition





Natural Language Translation of JPL Tidbit Rules

The section below defines all the tidbit rules as specified by the ESM scientists:

* The Tidbit rule T1 applies frequently if Freq, PRI, PW, and Time of the record are contained in the activity.
* If Freq, PRI, and Time of the record are contained in the activity, this Tidbit rule T2 sometimes applies.
* If Freq, PW, and Time of the record are contained in the activity, this Tidbit rule T3 sometimes applies.





Knowledge Populated in Cortex



Potential Audrey Data Sources

• First Responder Wearable Sensors



IoT, Smart City sensors



Emergency Management Centers



Internet, Social Media



IPL





Teaching Audrey Operational Process Audrey Knowledge Editor



Audrey Learn About User

User Profile

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	First Name						
	Bill						
	Last Name						
Pill Podgorg	Rodgers						
SENIOR FIRE FIGHTER	Mobile Number						
SEND MESSAGE	+1 646 580 6284						
	Title						Icar Protoroncoc
슈 Overview	Senior Fire Fighter						
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	Saus Changes	EMT.Intermediate		User Account	Settings personalization a	and representation	
	Save changes Cancer						
						PROFILE ACCOUNT	Personal Info Personal Preferences Privacy Settings
				5		Preference for Alerts via Augmented Reality	₽ •
				Q	HO I	Minimum and Maximum Allowed Audible Warnings	a (p) (p)
				Bill Rodgers SENIOR FIRE FIGHTER	Rodgers FIRE FIGHTER		Audrey will send audible alerts with varying degress of volume based on alert severity. This helps set a min and max for dynamic audio range.
				SEN	D MESSAGE	Rate of Sensor Discovery	B Second Common 10 Second
							Determine how often you want Audrey to search and discover nearby Sensors. Lower range will provide
				Account Set	ttings		cose to reachine uncovery, while consuming more outery power.
						Rate of Bluetooth Low Energy Advertising Packet Broadcast	I I I I I I I I I I I I I I I 1 5 10 15 20 25 Lower rate will save battery power but limit ability for other to discover you. I </td
						Save Changes Cancel	

DHS S&T Next Generation First Responder (NGFR) Program AUDREY Artificial Intelligence Agent and Internet of Things (IoT)



Situational Awareness Reasoning Process



(4) Fuse situationally relevant information in real-time to provide insight to decision makers and first responders to enable them to make the best possible decisions relative to their role



Intelligence



(3) Ontologies used by Audrey to autonomously classify and reason over their environments







Themselves In Harms Way

Audrey / Audrey Agent



Questions?

* Source: fullhdpictures.com

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