



SPEECH RECOGNITION CHALLENGES IN THE CAR NAVIGATION INDUSTRY

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HUNGARY

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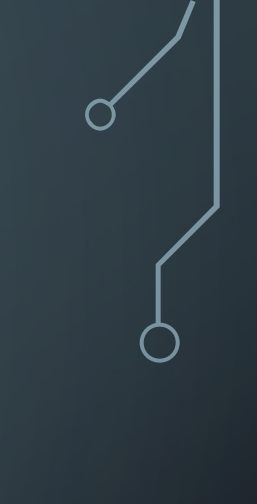
3. Challenging ASR Features



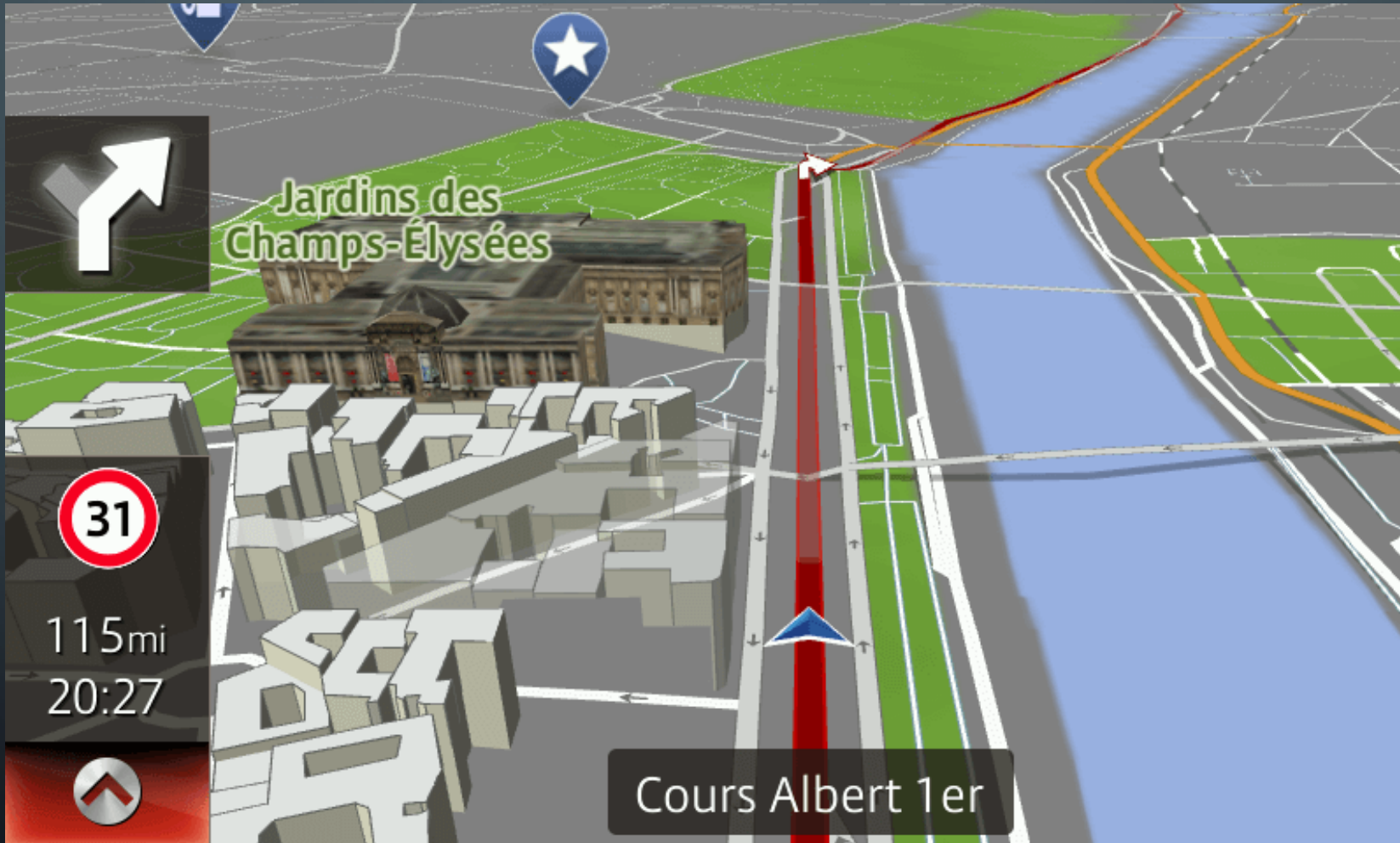


TOPIC 1.

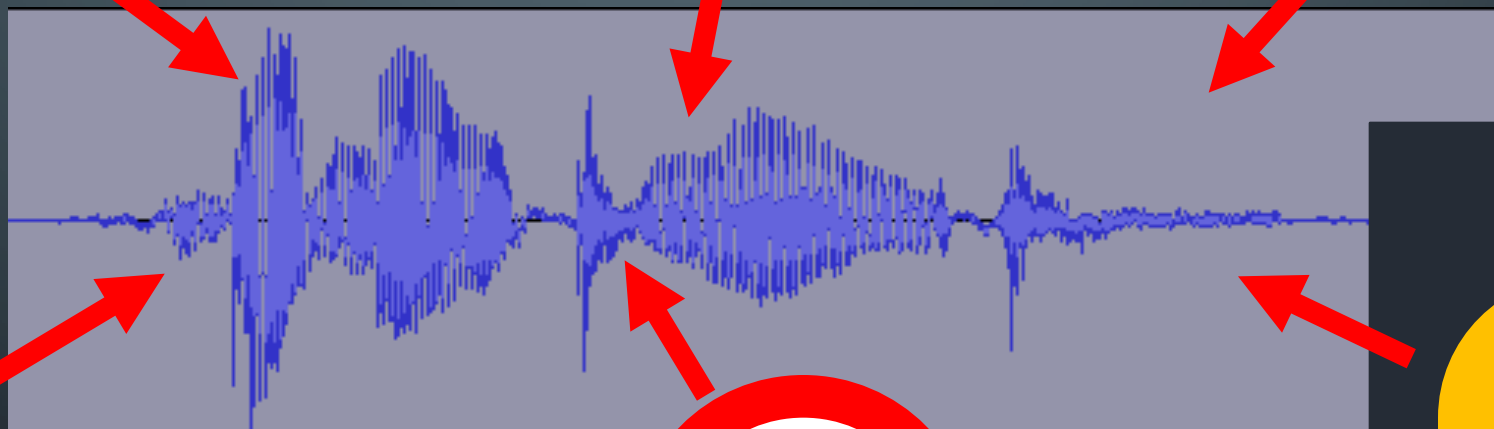
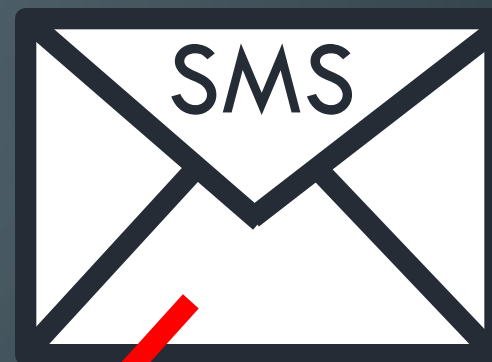
Status of TTS



DECREASING DRIVER DISTRACTION



SHARED RESOURCE



TIMING AND VERBOSITY

1. "In 100 meters, turn left on Wellington St West, then take next right."
2. "In 70 meters, turn left on Wellington St West."
3. "In 50 meters, turn left."
4. "Take the next left."



ALIGNMENT

"Turn left in **50** meters."

"In **50** meters, turn left."



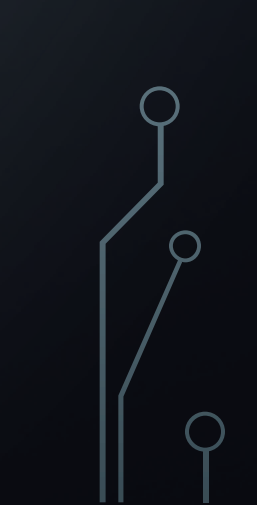
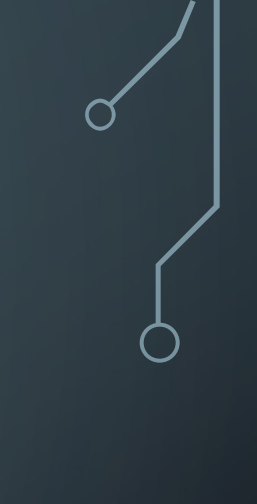
GRAMMATICAL CORRECTNESS AND MULTILINGUALITY

- "Traffic jam ahead on Presnenskiy Pereulok."
- "die Bahnhofstrasse"
 - "Stau vor **an der Bahnhofstrasse**."
- "Пресненский переулок"
 - "Пробка впереди **на Пресненском переулке**."

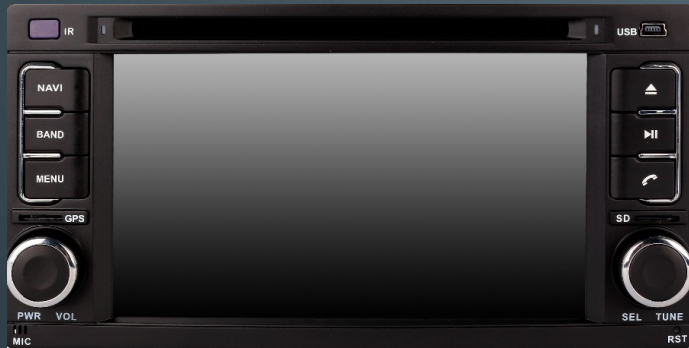


TOPIC 2.

ASR Essentials



ASR - INGREDIENTS



Embedded

- Large lists
- Grammar
- Spelling
- Limited NLU

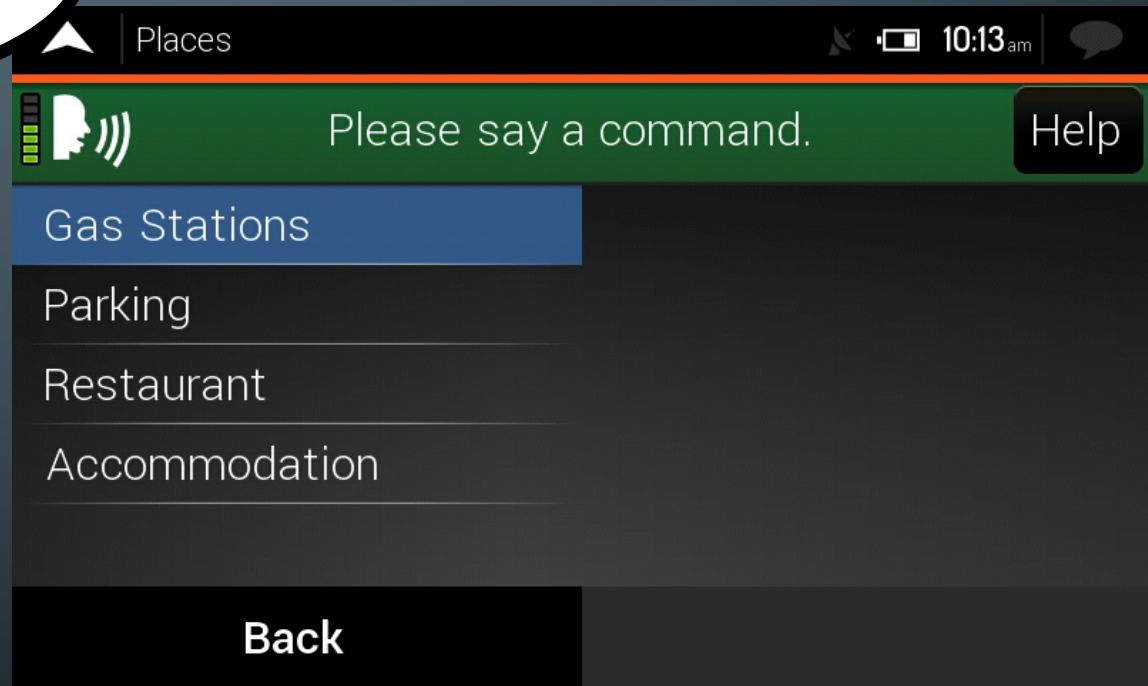


Server-based

- Dictation
- NLU structures
- User model

VOICE COMMANDS

*FUEL
STATION!!*



COMMAND ALIASES AND NLU

<ASR_KEY_PARKING>: ([rechercher] | [trouver]) [un] (parking | parc de stationnement);

<ASR_KEY_PARKING_ALONG_ROUTE>: ([rechercher] | [trouver]) [un] parking sur l'itinéraire | ([rechercher] | [trouver]) [un] parc de stationnement sur l'itinéraire;

<ASR_KEY_PARKING_AT_DESTINATION>: ([rechercher] | [trouver]) [un] parking ([près de la] | [à]) destination | ([rechercher] | [trouver]) [un] parc de stationnement ([près de la] | [à]) destination;

<ASR_KEY_PARKING_NEARBY>: ([rechercher] | [trouver]) [un] parking près d'ici | ([rechercher] | [trouver]) [un] parc de stationnement près d'ici | ([rechercher] | [trouver]) [un] parking proche d'ici | ([rechercher] | [trouver]) [un] parc de stationnement proche d'ici;

ONE-SHOT ADDRESS ENTRY

Destination

4490

Buckingham Rd, Royal Oak, MI

1st

<command>

<...>

2nd

<Destination>

**<house
number>**

<state><city><street>

Result:

75%

4490 Buckingham Rd (70%)
Royal Oak (72%), Michigan (0 ft)

ADDRESS ENTRY – FIELD CONTEXTS

<level_1> <level_2> <level_3> <level_4>

アイチケン (33554432) アイサイシ (67108866) _dummy_ (99999999)

アカメチョウ(268439423)

アイチケン (33554432) アイサイシ (67108866) _dummy_ (99999999)

アカメチョウエヒガシ (268439425)

キョウトフ (33554446) キョウトシ (67109408) シモギョウク (134217766)

スワンチョウドオリマンジュウジサガルタカサゴチョウ (268598992)

ADDRESS ENTRY – ADDRESS POINTS

<number>: ...

<letter>: A | Бэ | Вэ | Гэ | Дэ | Е | Жэ | Зэ;

<street_center>: центр улицы | середина улицы;

<per>: дробь;

<corp>: корпус;

<stro>: строение | дом;

ADDRESS ENTRY – ADDRESS POINTS

<template_1>: <number> [<letter>];

<template_2>: <number> (<per> | <korp>) <number>;

<template_3>: <number> (<per> | <korp>) <number> <stro>

<number> [<letter>];

<template_4>: <number> [<letter>] <stro> <number> [<letter>];

<template_5>: <number> <per> <number> <korp> <number>

[(<stro> <number>)];

ADDRESS ENTRY – DISAMBIGUATION

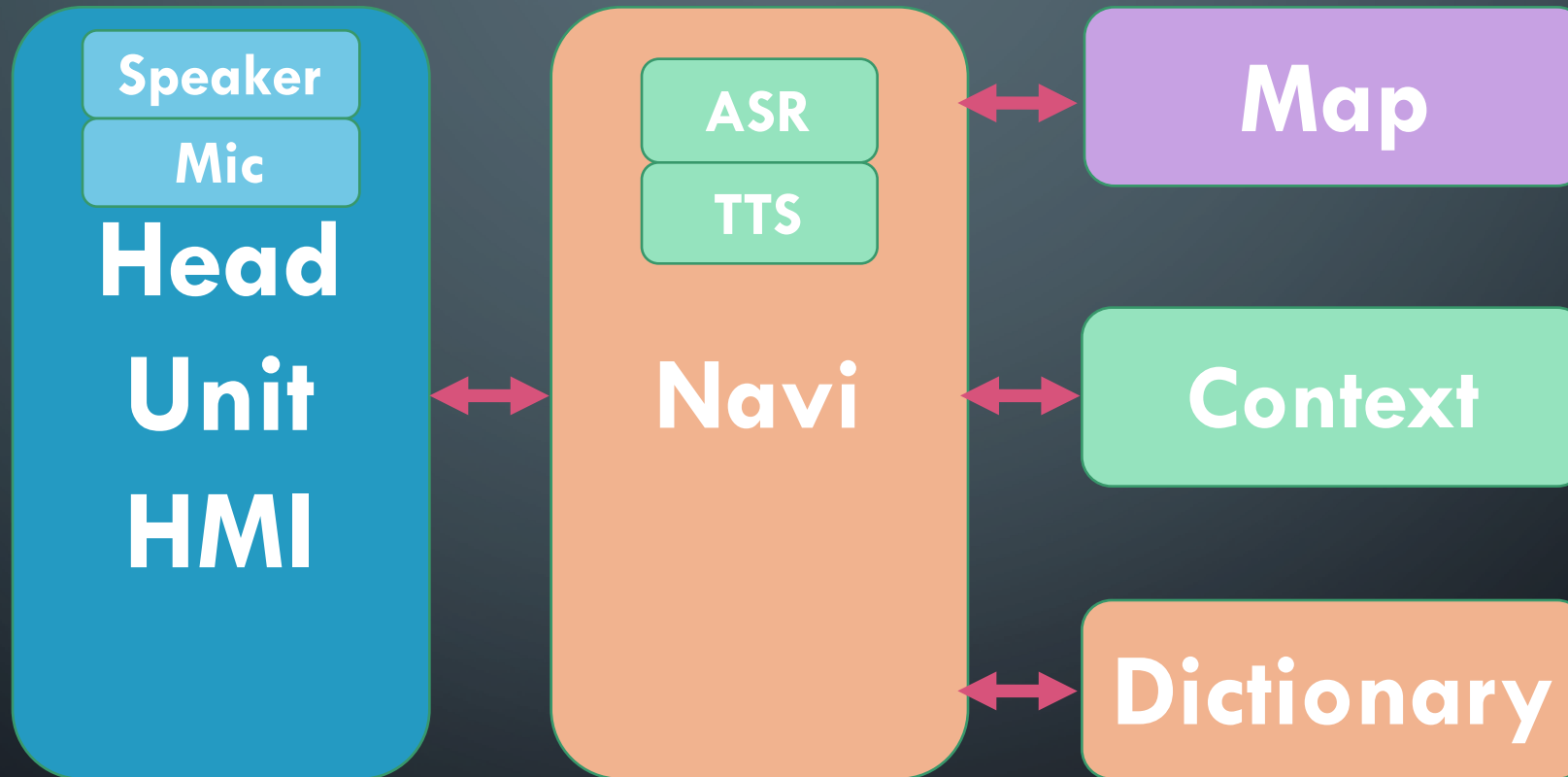
**6905 Telegraph Rd,
Bloomfield Hills, MI**

- (1) **Telegraph Rd**
- (2) S Telegraph Rd
- (3) Old South Telegraph Rd

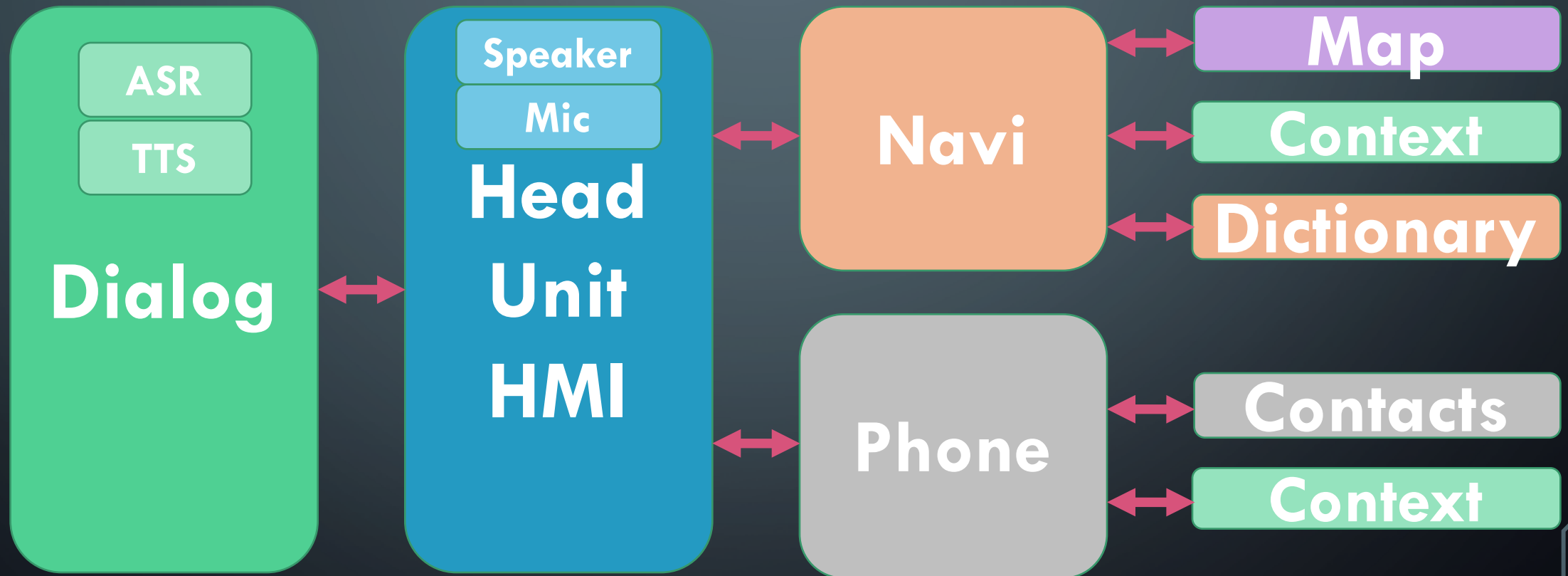
Line 1

```
Triggering sc_OVDE_DisambiguateAddress( Michigan, Bloomfield Hills, Telegraph Rd, 6905, )  
  
#1 umx, Old South Telegraph Rd, 499 [2] [ Bloomfield Hills/Bloomfield Twp  
(Oakland)/Detroit Metro, 48302 ] (-698908410,357501308)  
  
#2 umx, S Telegraph Rd, 2999 [2] [Bloomfield Hills/Bloomfield Twp (Oakland)/Detroit Metro,  
48302 ] (-698770464,357422443)  
  
#3 umx, Telegraph Rd, 6905 [1] [Bloomfield Twp (Oakland), 48301 ] (-698636608,356837120)
```

DIALOGUE SYSTEMS – IN NAVIGATION



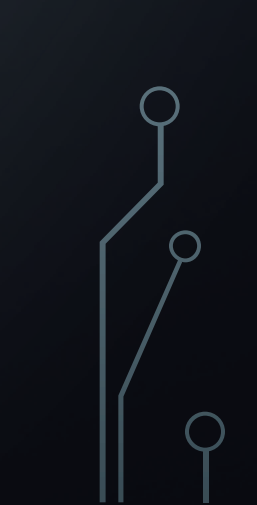
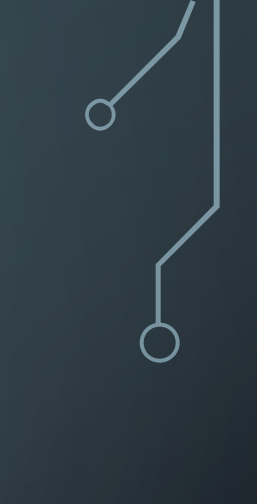
DIALOGUE SYSTEMS - CENTRALIZED





TOPIC 3.

Challenging ASR Features



TOP LEVEL NLU - ADDRESS

Drive me to...

Navigate to...

Take me to...

Route to...

Find me a way to...

Destination ...

121 Jackson St, Trenton, NJ

PLACE IN A CITY

Drive me to a...
Navigate to the nearest...
Take me to a...
Where is a...
Find me a way to a...
Find the nearest ...

McDonald's in **Bedford**

ADDRESS ENTRY IN INDIA

<state> <city> <locality/sublocality> <street>

Maharashtra, Pimprichinchwad, Sector 7 Bhosari, __dummy__

Delhi NCR, New Delhi, Block BC Mangolpuri Industrial Area Phase 2, __dummy__

Delhi NCR, New Delhi, Pocket 10 Block D Rohini Sector 15, __dummy__

Delhi NCR, New Delhi, Pocket 10 Block E Rohini Sector 15, __dummy__

Orissa, Raurkela, Sector D, Bishra Marg

Orissa, Raurkela, Sector C, Bishra Marg

Tamil Nadu, Chennai Metropolitan Area, Thirupathy Nagar Kolathur, 5th Cross Street

Tamil Nadu, Chennai Metropolitan Area, Thirupathy Nagar Kolathur, Bharathi Street

ALL ADDRESS POINTS IN INDIA

1-14

1-66/3

1-C/1

1/10-4/10

1/10062A

1/10101/5

1/15/16/17

1/UA

101AJ28

A1546

A19A

A1B26

A2/16-23/24-30

RZ283/64A

RZ46/AA1

RZB18/B

WRONG ADDRESS IN THE USA:

$"D" \notin \{"A", "B", "C"\}$

4490 Buckingham Avenue, Birmingham, MI

→ 4490 Buckingham Road, Royal Oak, MI

6412 South Telegraph Road, Redford, MI

→ 6412 North Telegraph Road, Dearborn Heights, MI

IMAGINATION 1982



REALITY 2016



CONNECTED CAR

- Extended processing power
- Accessing dynamic resources





INFOTAINMENT: FUN VS SAFETY

Drive carefully.

attila.vekony@nng.com

