

Multi-Modality Trends and Strategies in Automotive MMI

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Agenda

- ✚ **The Problem**
- ✚ **The Devices**
- ✚ **Ergonomics**
- ✚ **MMI Architecture**
- ✚ **Further Challenges - ADAS**

Information and Control for Drivers

- ✚ **Basic Driving controls and Displays**
 - **Driving Cluster (Dashboard)**
- ✚ **Security related information**
 - **Alarms for car failures**
 - **Seat belts/Reverse gear**
 - **Maintenance**
- ✚ **Entertainment control and distribution**
 - **Video/TV**
 - **Audio**
- ✚ **Navigation and Advanced Driver Assist (ADAS)**
 - **Route planning and guidance**
 - **Speed and obstruction management**
 - **Enhanced driving security**
- ✚ **Professional and lifestyle**
 - **Phone**
 - **Email**
 - **Telematics/Fleet services**

Trend 1: Massive Increase in Information Flows

+ Example:

BMW Series 5 Infotainment system

- 300+ Screens
- > 1000 user functions



Device Possibilities

Graphic Devices



Infotainment screens



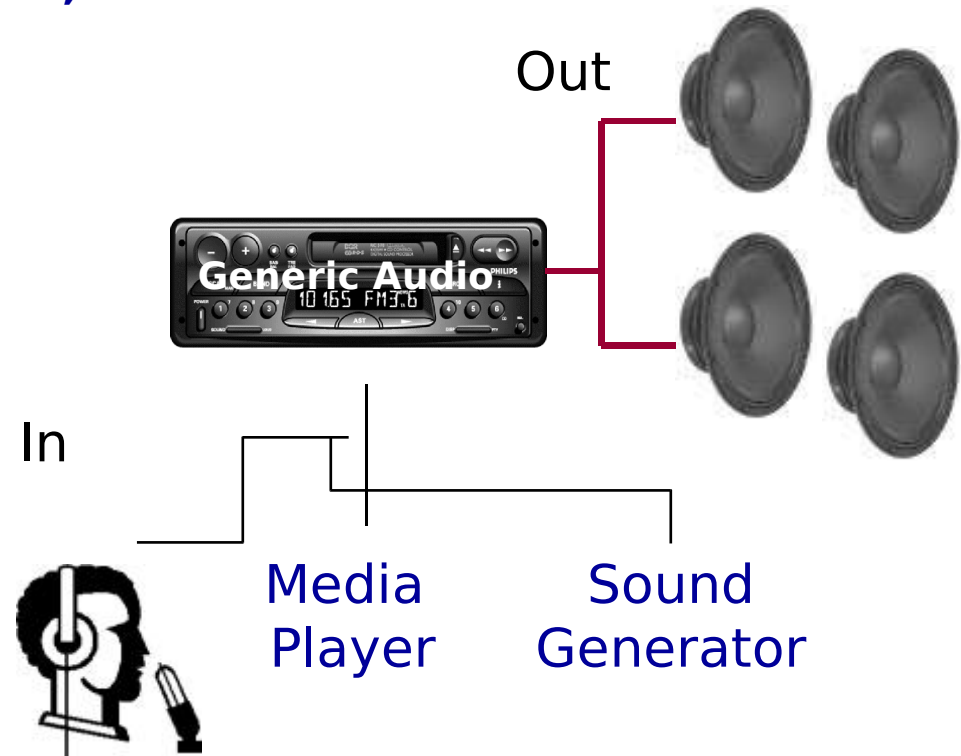
Head up display



Instruments

Audio Devices

- ✚ **Audio out (Loudspeakers, mixer, amplifier)**
- ✚ **Speech recognition**
 - Discrete
 - Continuous
 - Phoneme-based
 - Natural language



Haptic Devices

- ✚ **Programmable Haptic feedback devices (rotaries and joysticks)**
 - e.g. BMW Series 5 iDrive – Context dependent configuration and feedback



Gesture

- + **Character recognition**
 - Finger writing on pressure pad
- + **Virtual Interface**
 - Control gestures
 - Driver monitoring

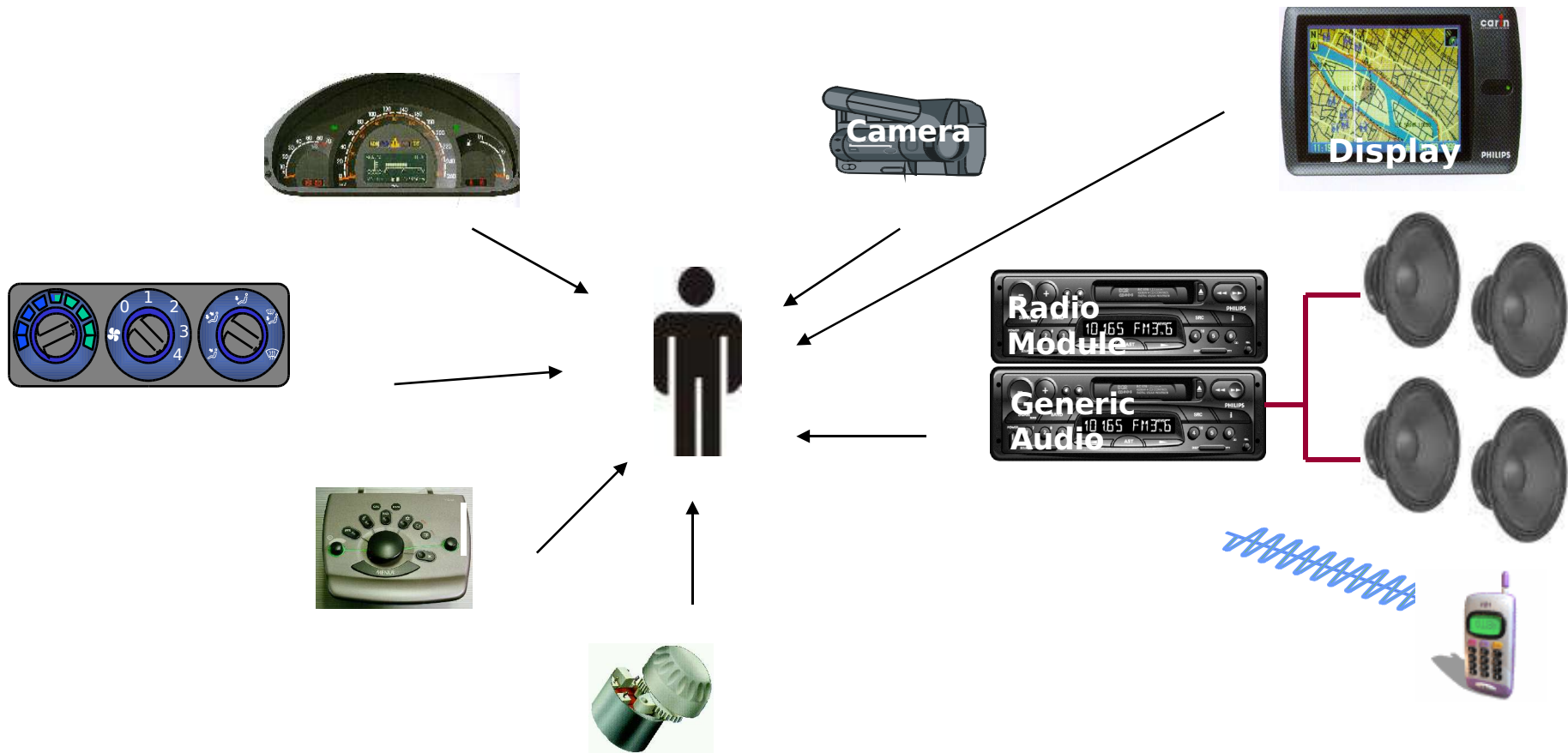


Camera

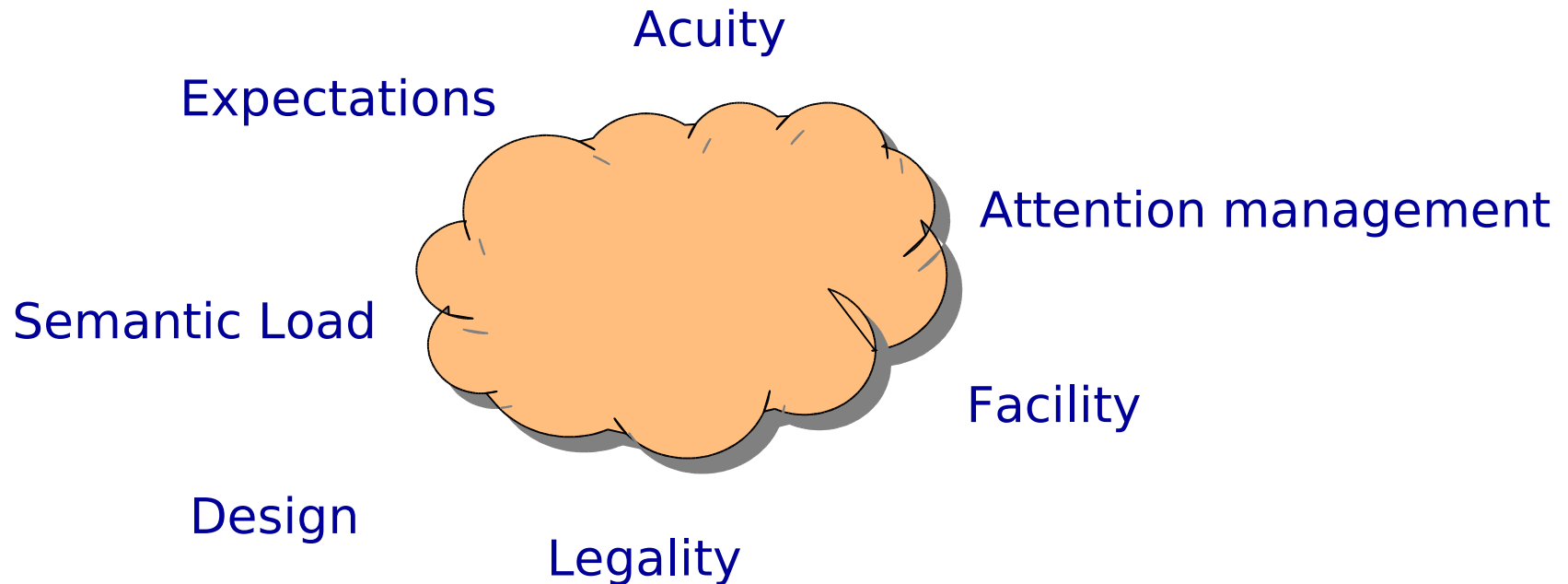


Touchpad + Rotary

Trend 2 : Device Diversity



Which Devices and When: Ergonomy



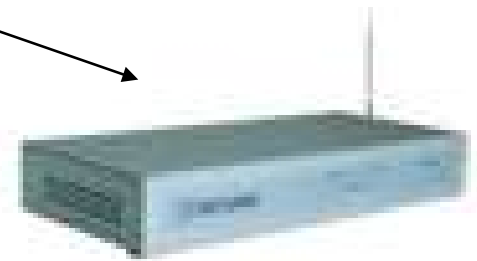
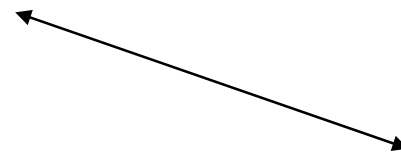
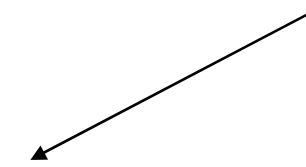
MMI Architecture For Multi-Modality

Device to Event



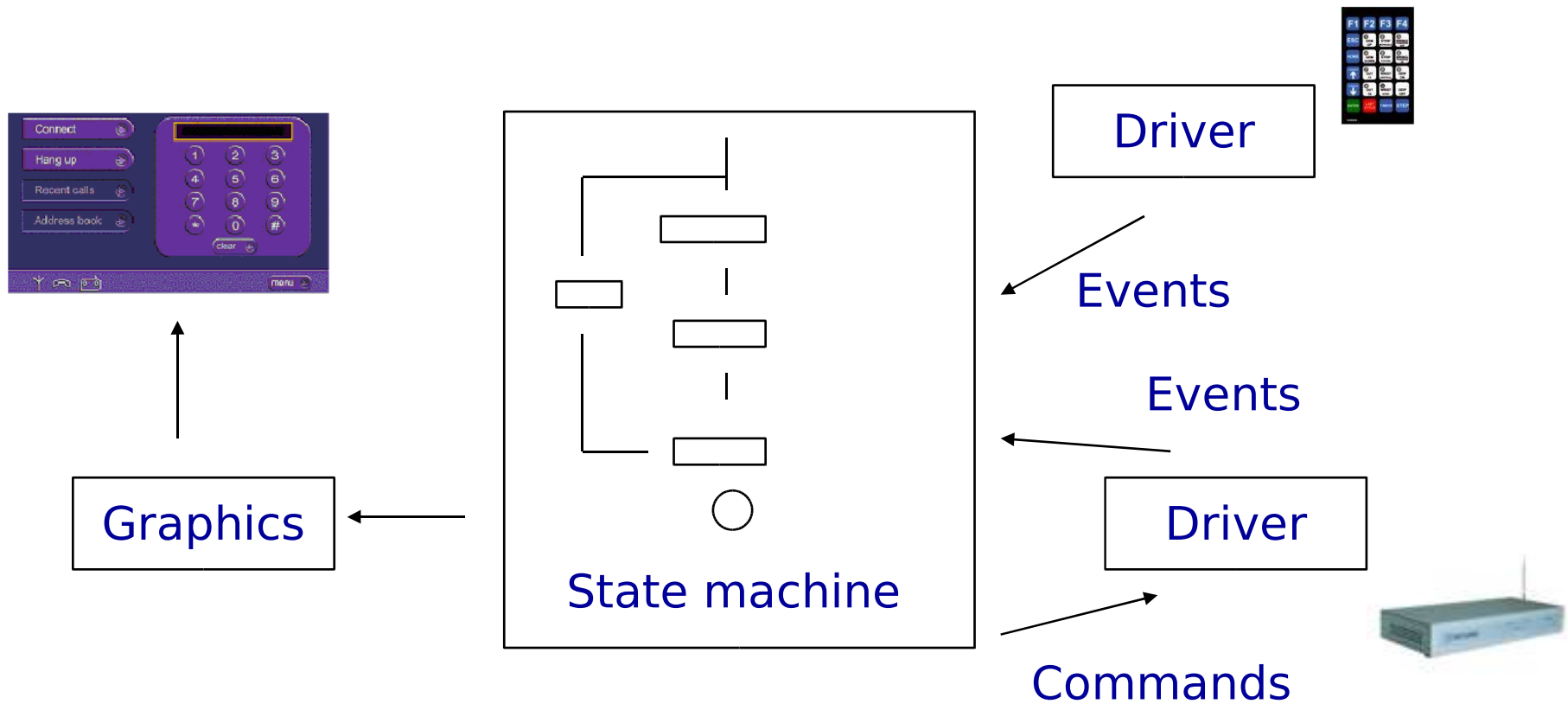
Screen

Keypad

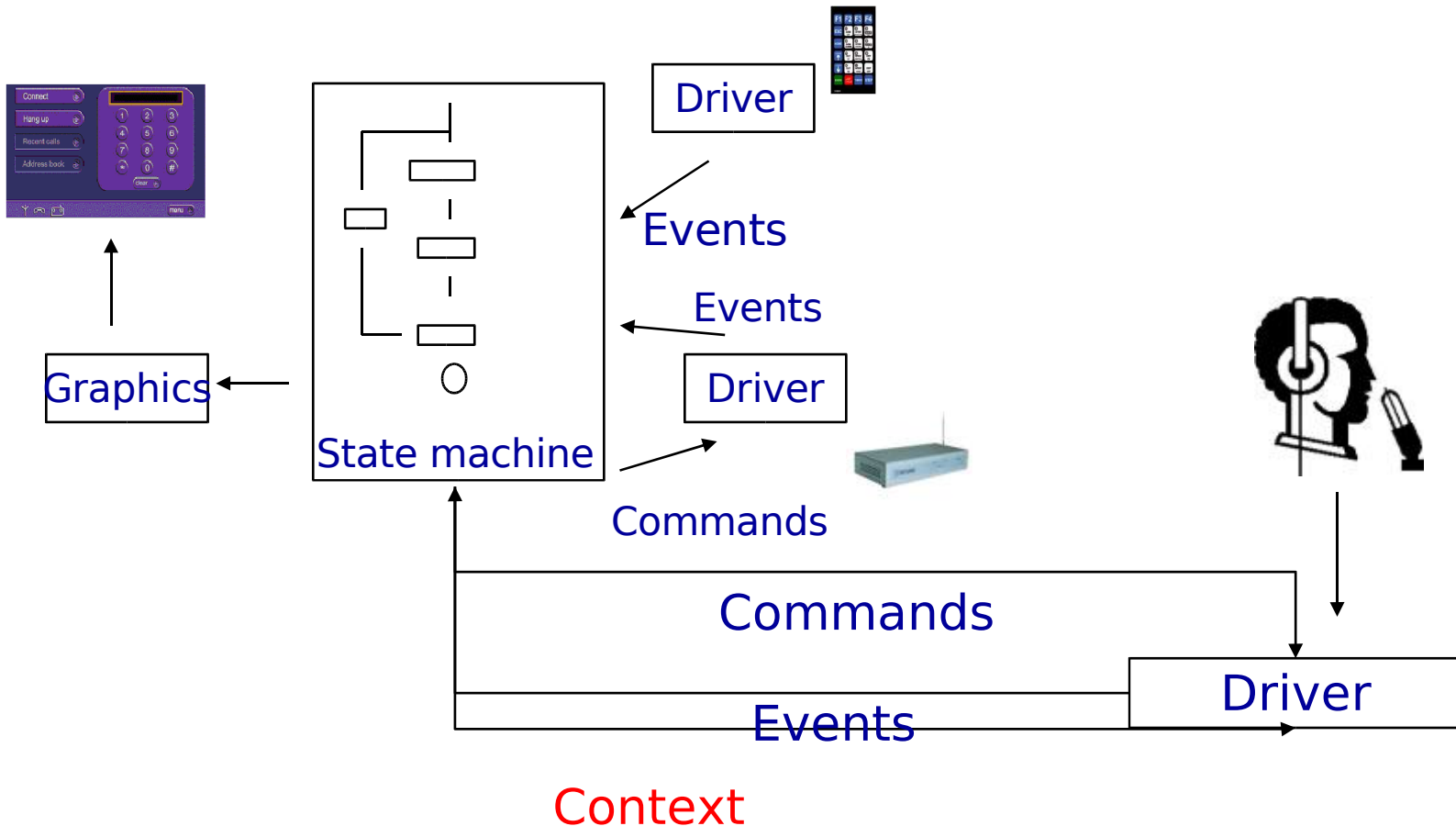


Phone

Traditional State Machine Model

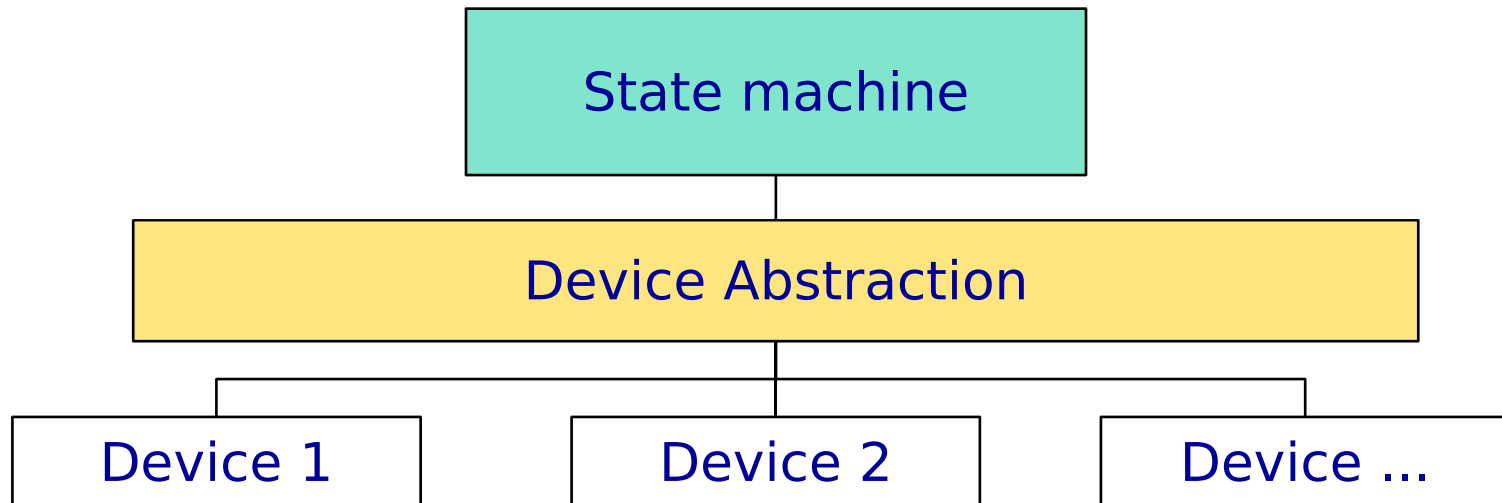


Add Another Device – with Context



Mixing Devices – Step 1 (State of the Art)

- ✦ Intermediate abstractions needed to allow source of events to be hidden from the state machines and applications
- ✦ For "context-free" devices this allows for mixed mode input



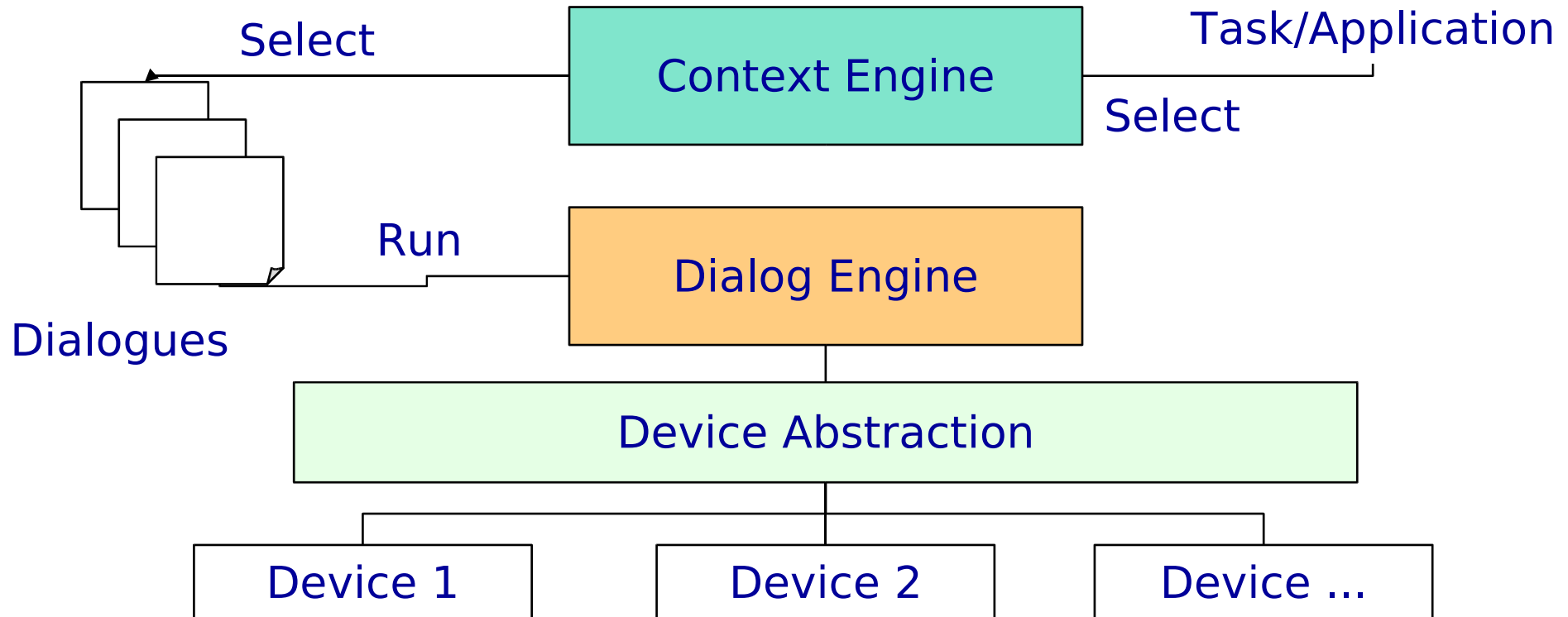
From Events to Dialogue

- ✚ **Context implies dialogue – prompt, input, confirmation, errors etc. Speech recognition is the classic example but within a multi-modal system dialogue become the basis for all user management**

BUT

- **Not a solved problem**

What is Envisaged



Trend 3: Rethink of Ergonomy Concepts

- ✦ **Increased treatment of dialogues for devices (not just Speech)**
- ✦ **Multi-modal possibilities for single tasks (entering a phone number for example)**
- ✦ **Increased research on Frameworks and concepts (big step for the automotive industry)**

BUT

Legal issues may have the greater impact.

Further On: Augmented Reality for Advanced Driver Assist

+ Combination of

- Real-time images
- Database Images
- Graphics
- Sound
- Animation
- Haptic Feed-back

=> **Attention management for Security**

Route Presentation



Attention Management for Security

- ✦ **Navigation databases can be used to identify problem areas such as dangerous junctions**
- ✦ **Combinations of enhanced reality, animation and 'appropriate' sounds can be used to ensure that the driver's attention is pulled onto the approaching risk. (similar to the image management in the film "MATRIX")**