

Driver's Availability Diagnosis :
A First Step Towards An Adaptive Management
of On-Board Information

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Global Context of the Research :

➤ On-board information sources increase :

- Driving assistance
- Telephone
- New services (e-mail, web....)

⇒ « *heterogeneous* » *flow of auditory information*

➤ Potential risks :

- Driver's overload & driving task disturbance
- Interference between vocal information themselves

INRETS Research in this area

Three main projects :

- **The European Project CEMVOCAS (1997-2000)**
- **INRETS internal Project (2001-2003)**
- **The European Project AIDE (2004-2008)**

CEMVOCAS Project :

- **The European Project CEMVOCAS** (*CEntralised Management of VOcal interfaces aiming at a better Automotive Safety*) :
 - **1997 (December) - 2000 (November)**
 - **Partners : Renault & Fiat, L&H, MetraVib & AKG, INRETS & UTL**
 - **Aim: To develop a « realistic » and « cheap » information manager**
 - ⇒ *Use only « basic » sensors (driver's actions + dynamic of the car)*
 - ⇒ *Don't use « complex » technologies (like image processing, radar, ...).*

Global Objective of CEMVOCAS : ***To Design & Develop a Centralized Manager***

➤ An « Integrative » Technology :

- ⇒ *Capable to **Centralize** all vocal information coming from on-board systems*
- ⇒ *Capable to **Supervise** the vocal information diffusion
(filter, determine the order of delivery, interrupt, temporize, etc....)*

➤ An « Adaptive » Technology :

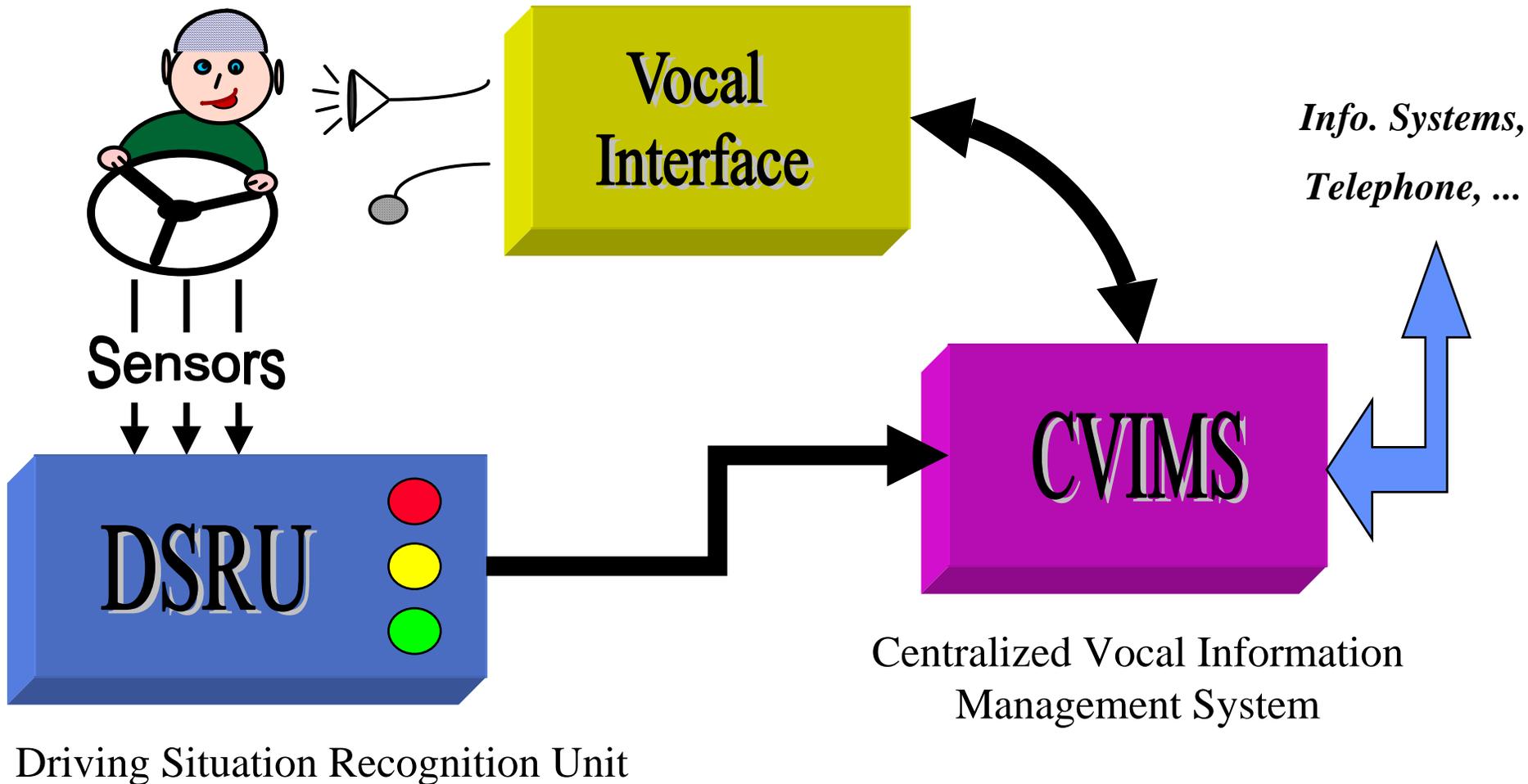
- ⇒ *Being able to manage vocal information by considering the attentional demands of the driving task.*
- ⇒ *Central concept : the level of « **Availability** » of the driver*
- ⇒ *Automatic “Availability” Assessment (in « **Real Time** »)*

“Availability”

➤ *Availability includes 2 main dimensions :*

- Ability of the driver to receive and process vocal information at this time.
- No negative effect of this information processing on the driving performance (=> attention sharing is possible in the current driving context).

General Architecture of CEMVOCAS



Methodology used to Design and Develop the DSRU

- **Data collection in real driving conditions (with “end users”)**
 - ⇒ *Data collected on INRETS car (Lyon and Lisbon)*
 - ⇒ *Driver’s action on controls and dynamic of the car (+ 5 video cameras)*
- **Drivers Interview** (based on the video film collected during the driving task) :
 - *Driver’s self assessment concerning his/her “availability level”*
 - *Human Factors Experts assessment concerning attention sharing*
 - *Files of data including : sensors info. / Availability diagnosis*
- **DSRU Development** : neural network (sensors / expected diagnosis)

CEMVOCAS :

Final Prototype Evaluation

- **Evaluation in real driving conditions with end-users (33)**
- **Several vocal messages (5) and 2 phone calls were sent :**
 - ⇒ During complex situations (Turning-Left, Insertion on motorway...)
 - ⇒ Information was « Managed » or « Not Managed » by CEMVOCAS
- **Drivers Interview (based on the experimental film) :**
 - Drivers' Opinion concerning :
 - ⇒ **Driving task Disturbance due to the information incoming**
 - ⇒ **The Interest of CEMVOCAS (adequacy with end-users' needs)**

Final Evaluation : main Results (1/2)

✓ **Messages effects on the driving task :**

Messages Management	Disturb		Don't disturb	
	Lyon	Paris	Lyon	Paris
With Cemvocas	5 %	5 %	95 %	95 %
Without Cemvocas	43 %	58 %	57%	42 %

Lyon (20 divers) / Paris (13 drivers)

Final Evaluation : main Results (2/2)

✓ Interest of CEMVOCAS system (Drivers' opinions) :

Very important	Important	Not very important	Not important at all
30% / 31%	65% / 61%	5% / 8%	0% / 0%
Very safe	Safe	Not very safe	Not safe at all
15% / 31%	80% / 54%	5% / 15%	0% / 0%
Very comfortable	Comfortable	Not very comfortable	Not comfortable at all
20% / 15%	80% / 77%	0% / 8%	0% / 0%

Total : 23 %

71 %

6 %

0 %

Lyon (20 divers) / Paris (13 drivers)

CEMVOCAS : Main Issues

- CEMVOCAS project has demonstrate :
 - ⇒ *The feasibility of an “adaptive” technology*
 - ⇒ *The Interest of this “Availability-based” management for end-users*

- **Limits :**
 - *Errors (around 20 % of erroneous diagnosis)*
 - *« Instability » of the diagnosis in some cases*
 - *Difficulties due to the neural network approach*

Availability Assessment : INRETS internal Project (2001-2003)

➤ New INRETS prototype :

- *Neural Network => Rules Base*
- *To have a more “logic”/ “rational” approach*
- *Better errors & performances understanding*
- *Best way to find solutions and increase the performances*

⇒ Efficiency of the new INRETS prototype is globally the same of the CEMVOCAS “DSRU”

Perspectives : ***INRETS involvement in AIDE Project***

- **To Design and Develop a “Driver’s Availability Estimator” Module (DAE)**
 - *Increase efficiency of INRETS prototype*
 - *Assess drivers’ Availability for new driving situations*
 - *Integrate information coming from a Cartographic DataBase (Increase Performances and Anticipate)*
- **“Driver’s Availability Estimator” is only a part of the AIDE Adaptive Interface**