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ENHANCED PROTOTYPE OF ARTIFICIAL PASSENGER FOR PERFORMANCE MONITORING SYSTEM

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ABSTRACT: An artificial passenger (AP) is a device that would be used in a motor vehicle to make sure that the driver stays awake. IBM has developed a prototype that holds a conversation with a driver, telling jokes and asking questions intended to determine whether the driver can respond alertly enough. Presumptuous the IBM approach, an artificial passenger would use a microphone for the driver and a speech generator and the vehicle's audio speakers to converse with the driver. A camera could be used to evaluate the driver's "facial state" and a voice analyzer to evaluate whether the driver was becoming drowsy. If a driver seemed to display too much fatigue, the artificial passenger might be programmed to open all the windows, sound a buzzer, increase background music volume, or even spray the driver with ice water. If a driver seemed to display too much fatigue, the artificial passenger might be programmed to open all the windows, sound a buzzer, increase background music volume, or even spray the driver with ice water. Conversational Interactivity for Telematic speech systems can significantly improve a driver-vehicle relationship and contribute to driving safety. But the development of full fledged Natural Language Understanding (NLU) for CIT is a difficult trouble that typically requires significant computer resources that are typically not available in local computer processors that car manufacturer provide for their cars. To address this, NLU components should be located on a server that is accessed by cars remotely or NLU should be downsized to run on local computer devices (that are typically based on embedded chips).

KEYWORD: voice analyzer, telematics, microphone

1. INTRODUCTION

Studies of road safety found that human error was the sole cause in more than half of all accidents .One of the reasons why humans commit so many errors lies in the inherent restriction of human information processing .With the increase in popularity of Telematics services in cars (like navigation, cellular telephone, internet access) there is extra information that drivers need to process and more devices that drivers require to control that power contribute to additional driving errors. This paper is dutiful to a discussion of these and other aspects of driver safety. The AP is an artificial intelligence–based companion that will be resident in software and chips embedded in the automobile dashboard. The heart of the system is a conversation planner that holds a profile of you, including details of your interests and profession. When activated, the AP uses the profile to cook up provocative questions such —Who was the first person you dated?‖ via a speech generator and in-car speakers. A microphone picks up your answer and breaks it down into separate words with speech-recognition software. A camera built into the dashboard also tracks your lip movements to improve the accuracy of the speech recognition.

2. FUNCTION OF ARTIFICIAL PASSENGER

2.1 Embedded speech recognition

Car computers are usually not very powerful due to cost considerations. The growing necessity of the conversational interface demands significant advances in processing power on the one hand, and speech and natural language technologies on the other. In particular, there is significant need for a low-resource speech recognition system that is robust, accurate, and efficient. An example of a low-resource system that is executed by a 50 DMIPS processor, augmented by 1 MB or less of DRAM can be found in [2]. In what follows we give a brief description of the IBM embedded speech recognition system that is based on the paper [4]. Logically a speech system is divided into three primary modules: the front-end, the labeler and the decoder. When processing speech, the computational workload is divided approximately equally among these modules. In this system the front-end computes standard 13- dimensional mel-frequency cepstral coefficients (MFCC) from 16-bit PCM sampled at 11.025 KHz. Front-End Processing Speech samples are partitioned into overlapping frames of 25 ms duration with a frameshift of 15 ms. A 15 ms

frame-shift instead of the standard 10 ms frame-shift was chosen since it reduces the overall computational load significantly without affecting the recognition accuracy.

A discriminative training procedure was applied to estimate the parameters of these phones. MMI training attempts to simultaneously (i) maximize the likelihood of the training data given the sequence of models corresponding to the correct transcription, and (ii) minimize the likelihood of the training data given all possible sequences of models allowed by the grammar describing the task. The MMI estimation process that was used in this work is described in [6] and [15]. In 2001, speech evaluation experiments yields improvement from 20% to 40% relatively depending on testing conditions (e.g. 7.6% error rate for 0 speed and 10.1% for 60 mph).

Fig 2.1 Embedded speech recognition indicator

2.2 Voice Control Interface

One of the ways to address driver safety concerns is to extend an efficient organization that relies on voice instead of hands to control Telemetric devices. CIT speech arrangement can significantly improve a driver-vehicle relationship and contribute to driving security. But the advance of fully fledged Natural Language Understanding (NLU) for CIT is a difficult problem that typically requires significant computer income that are usually not available in local computer processors that car manufacturers make available for their cars. To address this, NLU components should be located on a server that is accessed by cars remotely or NLU should be downsize to run on local computer devices (that are typically based on rooted chips). Our department is developing a "quasi-NLU" factor - a "reduced" variant of NLU that can be run in CPU systems with relatively limited resources. In our approach, possible variant for speaking commands are kept in special grammar files (one file for each topic or application).When the system gets a voice answer, it searches through files (starting with the most relevant topic). If it finds an appropriate command in some file, it perform the command. Or else the system executes other choice that are defined by a Dialog Manager (DM). The DM component is a rule based sub-system that can act together with the car and external system (such as weather forecast services, e-mail systems, telephone directories, etc.) and a driver to reduce task complexity for the NLU system.[

Fig 4.2 Embedded speech recognition device

2.3 Driver Drowsiness avoidance

Fatigue causes more than 240,000 vehicular accidents every year. Currently, drivers who are alone in a vehicle have access only to media such as music and radio news which they listen to passively. Often these do not provide sufficient stimulation to assure wakefulness. Ideally, drivers should be presented with external stimuli that are interactive to improve their alertness. Driving, however, occupies the driver's eyes and hands, thereby limiting most current interactive options. Among the efforts presented in this general direction, the invention suggests fighting drowsiness by detecting drowsiness via speech biometrics and, if needed, by increasing arousal via speech interactivity. When the patent was granted in May 22, 2001, it received favorable worldwide media attention. It became clear from the numerous press articles and interviews on TV, newspaper and radio that Artificial Passenger was perceived as having the potential to dramatically increase the safety of drivers who are highly fatigued. It is a common experience for drivers to talk to other people while they are driving to keep themselves awake. The purpose of Artificial Passenger part of the CIT project at IBM is to provide a higher level of interaction with a driver than current media, such as CD players or radio stations, can offer. This is envisioned as a series of interactive modules within Artificial Passenger, that increase driver awareness and help to determine if the driver is losing focus. This can include both conversational dialog and interactive games, using voice only. The scenarios for Artificial Passenger currently include: quiz games, reading jokes, asking questions, and interactive books. In the Artificial Passenger (ArtPas) paradigm, the awareness state of the driver will be monitored, and the content will be modified accordingly.

3. LITERAUTER SURVEY

First introduced in US Sensor/Software system detects and counteracts sleepiness behind the wheel. Seventies staples John Travolta and the Eagles made successful comebacks, and another is trying: That voice in the automobile dashboard that used to remind drivers to check the headlights and buckle up could return to new cars in just a few years—this time with jokes, a huge vocabulary, and a spray bottle. Why Artificial Passenger IBM received a patent in May for a sleep prevention system for use in automobiles that is, according to the patent application, "capable of keeping a driver awake while driving during a long trip or one that extends into the late evening. The system carries on a conversation with the driver on various topics utilizing a natural dialog car system." Additionally, the application said, "The natural dialog car system analyzes a driver's answer and the contents of the answer together with his voice patterns to determine if he is alert while driving. The system warns the driver or changes the topic of conversation if the system determines that the driver is about to fall asleep. The system may also detect whether a driver is affected by alcohol or drugs."

4. METHODOLOGIES

The AP is an artificial intelligence–based companion that will be resident in software and chips embedded in the automobile dashboard. The heart of the system is a conversation planner that holds a profile of you, including details of your interests and profession. When activated, the AP uses the profile to cook up provocative questions such as, ―Who was the first person you dated?‖ via a speech generator and in-car speakers. A microphone picks up your answer and breaks it down into separate words with speech-recognition software. A camera built into the dashboard also tracks your lip movements to improve the accuracy of the speech recognition. A voice analyzer then looks for signs of tiredness by checking to see if the answer matches your profile. Slow responses and a lack of intonation are signs of fatigue.

5. ALGORITHM FOR MONITORING HEAD/EYE MOTION FOR DRIVER ALERTNESS WITH ONE CAMERA

The invention robustly tracks a person's head and facial features with a single on-board camera with a fully automatic system, that can initialize automatically, and can reinitialize when it need's to and provide outputs in real time. The system can classify rotation in all viewing direction, detects' eye/mouth occlusion, detects' eye blinking, and recovers the 3Dgaze of the eyes. In addition, the system is able to track both through occlusions like eye blinking and also through occlusion like rotation. Outputs can be visual and sound alarms to the driver directly.

6. CONCLUSION

The reduction of conventional speech processes to low – resources processing was done by reducing a signal processing and decoding load in such a way that it did not significantly affect decoding accuracy and by the development of quasi-NLU principles. We observed that an important application like Artificial Passenger can be sufficiently entertaining for a driver with relatively little dialog complexity requirements – playing simple voice games with a vocabulary containing a few words. Successful implementation of Safety Driver Manager would allow use of various services in cars (like reading e-mail, navigation, downloading music titles etc.) without compromising a driver safety. Important issues related to a driver safety, such as controlling Telematics devices and drowsiness can be addressed by a special speech interface. This interface requires interactions with workload, dialog, event, privacy, situation and other modules. We showed that basic speech interactions can be done in a low-resource embedded processor and this allows a development of a useful local component of Safety Driver Manager.

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