

Speech Control and Speech Output for a Pioneer 3-AT Mobile Robot

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For applications in service robotics, voice control via speech recognition is a highly demanded technology. We have added a speech recognition application to an autonomous Pioneer 3-AT mobile robot to realize local and remote speech control features. We have adapted the commercial IBM ViaVoice Software[1], which is available for Linux and Windows, to communicate with the robots application programmers interface (API). The robot API consists out of two parts, an API for simple movement commands (ARIA) and an API for high level autonomous robot behavior (Saphira). Together with a Linux or Windows based SIP Softphone (SIP, Session Initiation Protocol, RFC 3261)[2] the robot can be controlled by speech over a wired phone line as well as by mobile phones. In service robotic applications, this feature can be used to instruct the mobile robot via phone for new tasks. To monitor the state of the local operating system and sensor information the pioneer robot is equipped with a wireless LAN (WLAN) adapter. But in case of loss of WLAN connection or system shutdown triggered by low power batteries no connection is available to monitor these events. No internal display is available in mobile usage. It is inconvenient to connect the onboard PC to an external display and input devices. Speech output is an alternative way to monitor these events. We have realized robot speech output by using the 'mbrola' speech synthesizer[3] software which uses a list of phonemes as input. With 'Txt2pho'[4], a german text to speech (TTS) front-end for 'mbrola', we are able to generate phonemes for speech output from text based system event messages. We are using these TTS techniques to generate audio based teaching material (mp3, wma and podcast) automatically from text material, too[5].

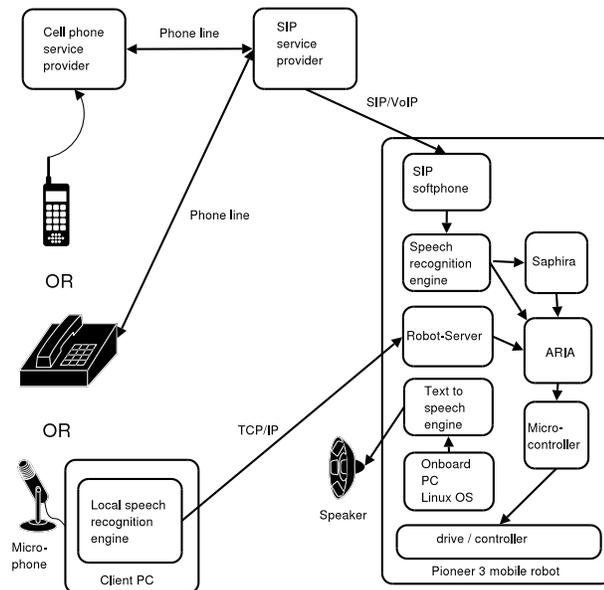


Figure 1: Communication structure for speech control of a Pioneer 3-AT robot

[1] <http://www-306.ibm.com/software/info1/websphere/index.jsp?tab=products/mobilespeech>

[2] <http://www.ietf.org/rfc/rfc3261.txt>

[3] <http://tcts.fpms.ac.be/synthesis/mbrola.html>

[4] <http://www.ikp.uni-bonn.de/dt/forsch/phonetik/hadifix/HADIFIXforMBROLA.html>

[5] Reactive robot programming, M.Sc. courseware 21605
<http://prt.fernuni-hagen.de/lehre/PRAKTIKUM/KURZ/roboter.html>

[6] <http://prt.fernuni-hagen.de/pro/pioneer/>