V.Ga: A Voice and Gesture Controlled Robot Assistant

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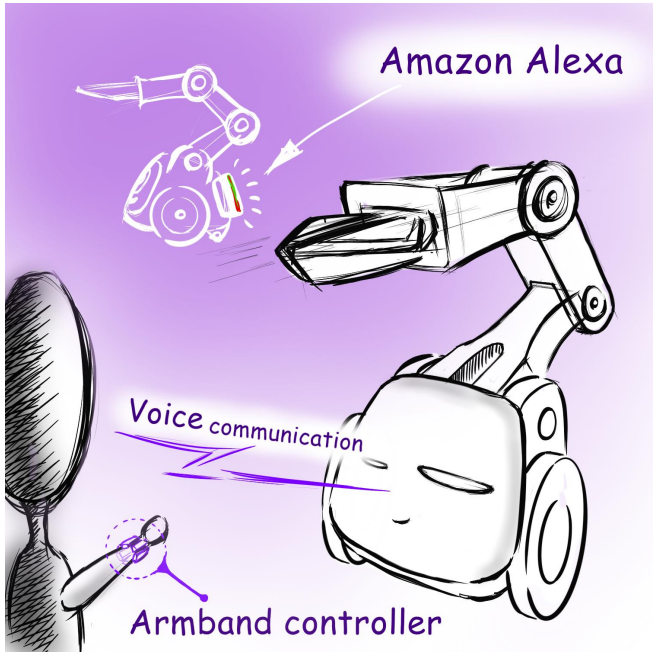

Figure 1: V.Ga overview: personal robot controlled with voice and gesture

Abstract
We present V.Ga, a voice and gesture controlled robot assistant for service and companionship. V.Ga is a mobile manipulator robot equipped with the Amazon Alexa voice service to enable natural conversational communication with users. The robot is also equipped with a front depth camera to add vision capability for environmental interactive tasks. Using a Myo armband, users can achieve full manipulation of the robot arm for interactive "hands-on" control. With humanoid facial expression and LED light indicator, V.Ga has strong potential to deliver an expressive and interactive user experience as a companion and service robot.

Author Keywords
Robot assistant; Voice control; Gesture control

Introduction
Recent development has brought numerous novel commercial products in the area of personal robotics, most of which are equipped with display and voice communication capability to ensure bi-directional and expressive interactions with the users. However, many of these robots can only move around and lacks the ability to physically interact with the surrounding environment. Moreover, the human partner usually does not have full control to manipulate the movement of the robot using only the voice communication.

We propose V.Ga, a Voice and Gesture controlled robot Assistant for service and companionship. As illustrated in Figure 1, V.Ga is a mobile robot with a multi-DOF robot arm gripper and an embedded depth camera. It can interact with users via voice communication powered by Amazon Alexa to execute environmental interactive tasks from high-level voice command, like “V.Ga, give me the water bottle.” The user can also manually control the robot arm using the arm gesture with a Myo armband. Besides vehicular and manipulator movement, V.Ga is able to react to users via facial-expression display, voice conversation, and LED indicator. With the multi-modal input and output capability, V.Ga can engage users with highly interactive activities and therefore has strong potential to deliver novel user experience as a personal robot.

V.Ga System Overview

Voice Control

Figure 2: Voice control use cases demonstration

Using the Alexa voice service, users can directly communicate with V.Ga via natural communication. Besides reacting with the front visual display and audio reply, V.Ga can also respond with autonomous vehicular and manipulator movement. With the voice communication, user can perform interactive activities with V.Ga, like “V.Ga, shake hands with me.” or “V.Ga, do a little dance for me.” Furthermore, enabled by the depth camera and spatial tracking of the armband, V.Ga can even perform complex and accurate task like “V.Ga, go get the red ball and place it in my hand.”

Gesture Control

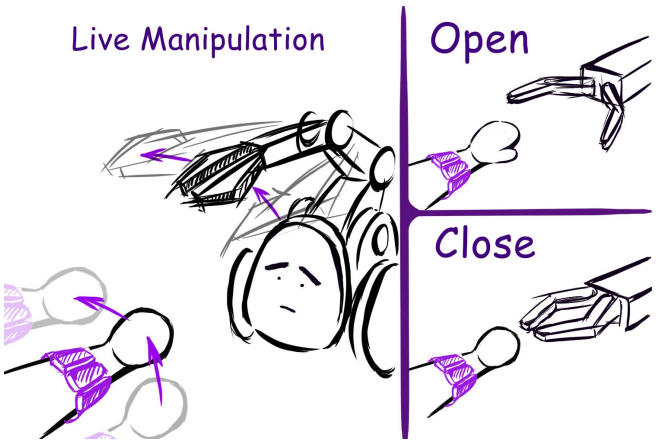

Figure 3: Gesture control demonstration

Though it is hands-free and intuitive, voice control is hard to achieve full motion control of the robot. This is why V.Ga also comes with a Myo armband controller that gives the user full capability to manipulate its robot arm gripper. Once in the ‘Live Manipulation’ mode, the end-effector of the robot arm will follow the motion of user’s arm movement and the gripper will be controlled by user’s ‘open’ and ‘grasp’ hand gesture.