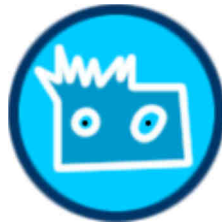# SITPLUS Manual

Manual

v0.5.x

Introduction

SITPLUS is a freeware software application whose main goal is to provide recreational activities for people with multiple disabilities. It offers new forms of interaction based on computer vision and voice, to produce a result in the form of image and sound. Inspired by the cause and effect applications, SITPLUS provides a tool for continuous and remote interaction, attainable to the majority of people with multiple disabilities.
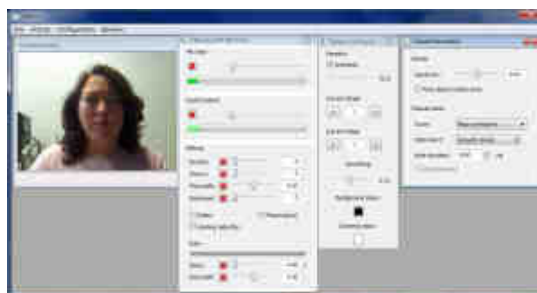
SITPLUS was born as a research project in the Cerebral Palsy Centre (APPC) of Tarragona (Spain) in collaboration with CREA Software Systems and others. SITPLUS is the result of nearly three years of research, development and direct intervention with people with cerebral palsy in the APPC. Inspired by the cause and effect applications, SITPLUS provides a tool for continuous and remote interaction, attainable to the majority of people with multiple disabilities. It was conceived in the APPC in late 2007 to try to provide a tool to the group of people whose combination of motor, cognitive and even sensory limitations prevented them from accessing other commonly used tools. Experimental sessions, conducted in the laboratory that the APPC has devoted to this project, show that this tool not only promotes participation, engagement and play for many people with moderate to severe impairments, but is also very motivating for users with mild impairments.

Although SITPLUS focuses on people with cerebral palsy, we believe that it could benefit other people with cognitive disabilities. Moreover, it can also be useful as a platform for game or interactive music and visual arts research. Indeed, SITPLUS is conceived as an application framework in which several activities using resources run. We call resources things like input sound analysis, computer vision based motion tracking, drawing and sound generation algorithms, and so on. We call activities these pieces of software that employ resources to do something useful (e.g. let someone interact in some way). The idea behind this model is to allow reusing those components to provide rich interactive scenarios whilst keeping simple its further development and usage.

Currently, SITPLUS is being developed, but now you can already enjoy three provided activities as described in this manual.

Installation

To run SITPLUS properly you need a personal computer with:

- Dual core CPU at 1.5Ghz or better
- Soundcard and speakers.
- Microphone
- Web camera (high quality webcam recommended).
- Microsoft Windows XP SP3, Vista or 7
- (Optional but recommended.) Good quality sound system and secondary display or projector.

Also you should install these free applications:

- ASIO4ALL drivers. These drivers reduce latency of real-time sound processing improving the user experience.
- pd-extended. IMPORTANT: install with the default options.

Before installing SITPLUS first uninstall any previous version in your computer. Finally run the installation package and follow the instructions.

Configuration

SITPLUS requires sound input (i.e. a microphone) and output, and a web camera. Make sure that these devices are installed and work properly before running SITPLUS. Also set system sound volume (both recording and playback) accordingly.

Run SITPLUS from the Start menu (*SITPLUS-Project* entry).

The first time you run the application you need to configure several options.
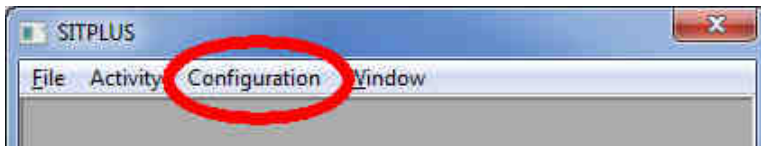
Audio configuration

Open the audio configuration dialogue (Configuration -> Audio).

Once opened you should hear a continuous sound. If no sound is present (especially on Windows Vista and 7) make sure you have previously closed other applications dealing with sound (e.g. media players, web browsers, etc.).

Set "Delay" to the minimum possible value before you get sound defects. You can also check if the microphone works properly by selecting "Microphone".

Finally, click "Close" and answer "Yes" to save settings.

Web camera configuration

Open the web camera configuration (Configuration -> Camera).

Choose the camera you wish to use in the selection dialogue. Next the camera configuration dialogue should open and begin streaming live video (see picture below).
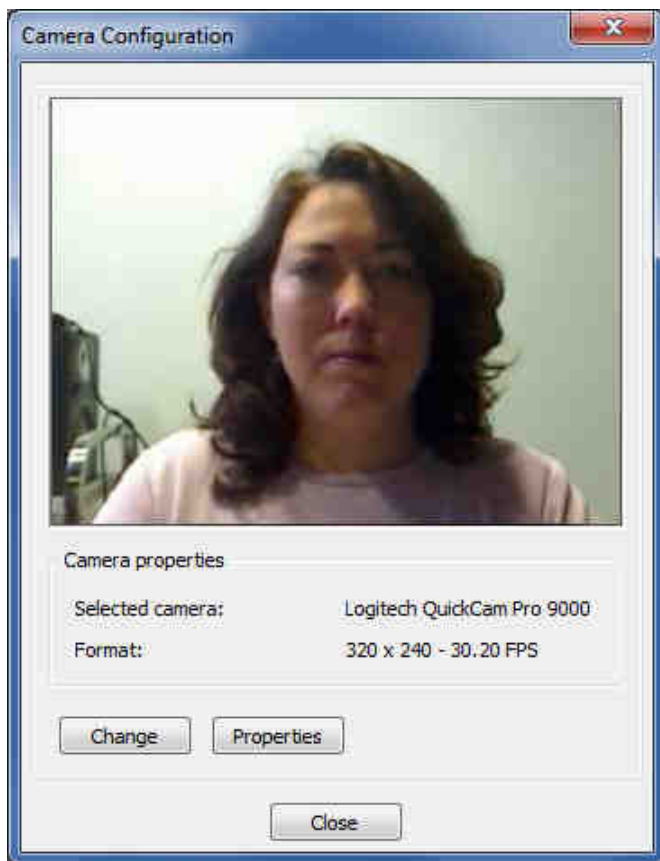
To change the selected camera (if you have two or more cameras) click on "Change" to open the selection dialogue again.

When clicking on the "Properties" button you can adjust the camera parameters (brightness, gain, zoom, etc.). These parameters depend on the camera brand and model. Best results are obtained when the frame rate is between 25 and 30 fps. Set the camera parameters accordingly (perhaps you might need to consult your camera instructions).

When finished click "Close" to close window saving changes.

MIDI configuration

Open the MIDI configuration (Configuration -> MIDI).

When asked to choose the MIDI device to use you should select "Microsoft MIDI Mapper" unless you have another MIDI device you want to use (e.g. external MIDI module). Next the dialogue shown below should open.

Click "Test" to reproduce a simple raising scale. Finally click "Close" to close window saving changes.

Activities

Activity: Playing with the voice

A microphone is used to pick up the users' oral emissions or other sounds like breathing or tapping. The audio input stream is then processed using different digital effects like reverberation, chorus, echo, etc. The resulting audio is then amplified and sent to the speakers. The amplitude of the resulting sound is also used to provide graphical feedback. The dialogue shown below lets to choose among different sound effects that can be combined.
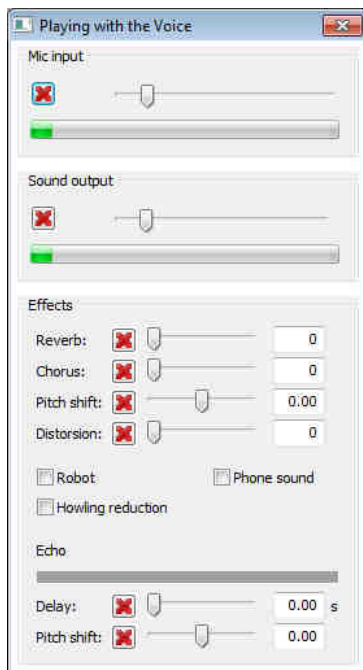

Options:

- Mic input. Microphone input gain.
- Sound output.
- Effects
  - Reverberation
  - Chorus
  - Pitch shift
  - Distortion
  - Robot like sound
  - Phone like sound
  - Echo. Time between repetitions and pitch shift of each repetition can be set.
- Howling cancellation. Helps reducing the negative effects of acoustic feedback.

In addition to the sound processing a graphical window is opened where a simple drawing is shown reacting in accordance with sound. (Further versions will expand the drawing capabilities.). The graphical window opens outside the main window. Therefore, it can be moved freely and placed in other screen (i.e. the screen the user is looking at).

Activity: Virtual instrument

Using computer vision we select an area of the frame where users' motion is extracted. This motion is accumulated and the result is used to play one note from a predefined score (i.e. when the user moves, musical notes are played). The specific musical instrument and score can be selected. This activity opens two windows inside the main one.

- Camera window. It shows live video from the camera and it lets choose how motion will be extracted. The big external box (a) delimits the area in which (optionally) gross motion is detected and used to automatically place the small box. The small box (b) delimits to area in which fine motion is extracted (used to play notes). Both boxes can be resized (by the sides) and moved (by the corners) around the frame. Finally the arrow (c) is used to set the main direction of the motion we plan to extract (horizontal in the picture).
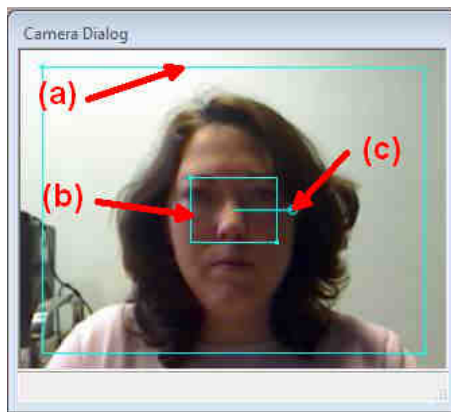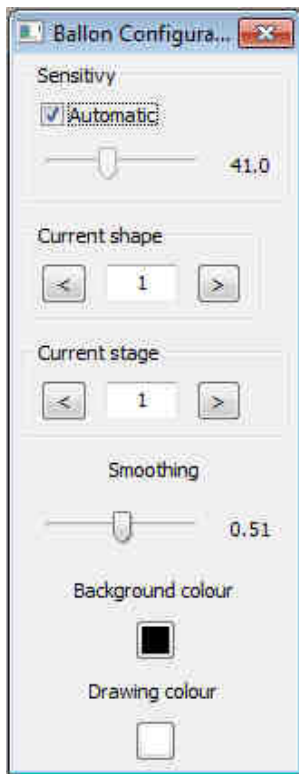
- Virtual instrument window.
    - Sensitivity. Motion tracking sensitivity. Set it according to the users' motion range.
    - Auto-detect motion area. When checked the small box (b) is automatically placed on the area inside (a) where there is motion.
    - Score. Selects the score which will be played.
    - Instruments. Selects the musical instrument to use among 128 options.
    - Note duration. How long a note will be playing once triggered (in milliseconds).
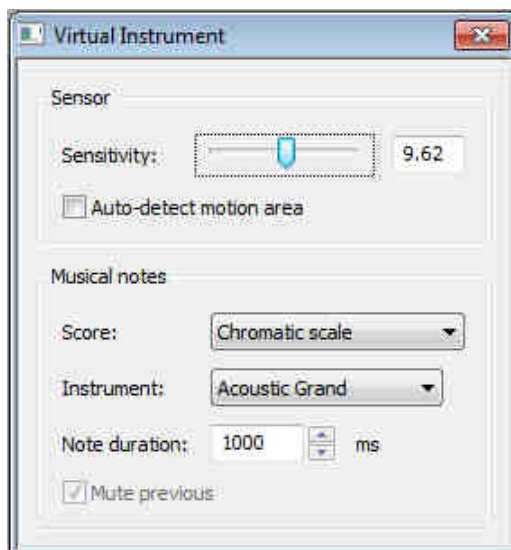
Activity: Blow up balloon

It opens three windows: one external graphical window (as in the activity "Playing with the voice") and two windows inside the main one. (NOTE: this activity is highly experimental and still being developed).

- Camera window. It shows live video from the camera and lets to choose how motion will be extracted. As opposed to the previous activity, in this case only an estimate of overall motion inside the box is computed.
- Balloon configuration window.
    - Sensitivity. Motion analysis sensitivity. Set it according to the users' motion range. When the "Automatic" box is checked the sensitivity is automatically set depending on how much motion is detected.
    - Current shape. Four possible geometrical shapes can be selected.
    - Current stage.
        - 1) Drawing size is proportional to the instant motion. Uses colours selected below.
        - 2) As in 1) but automatically changing the pair of used colours.
        - 3) Drawing size is proportional to the accumulated motion (mimicking the act of blowing up a balloon). Colours as in 1).
        - 4) As in 3) and colours as in 2).
    - Smoothing. Sets how fast the drawing and the sound synthesis react to the users' gestures. The lower the value, the faster the reaction is.

Mixing activities

Several activities can be started at the same time if desired. There are, however, some limitations on Windows Vista and 7 that prevent using the "Virtual instrument" in conjunction with any of the other two activities.