

AT and GPII: Maavis

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Abstract. Maavis is a computer framework that provides an extremely simple way to perform common place computer activities like playing media, viewing photos, accessing web information and making video calls. It is ideal for use with a touch screen. A fundamental principal is that it does not appear to be a computer and yet affords access to computer technology that is of benefit and interest to older users, especially those with age related mental health issues. It also has applications for people with learning difficulties or physical disabilities, or even simple kiosk interfaces as it is designed to work best with a touch screen. Integration of Maavis with the GPII has undergone successful validation tests and further development work is ongoing.

Keywords: Accessibility, touch screen, learning disabilities, aging, dementia.

1 Introduction

Individuals with cognitive disabilities such as dementia, often experience diminished independence and social isolation [1]. As we move to a digital world, these individuals find that participation in education, health, employment, school and civic life is becoming increasingly challenging due to lack of access to information and communication technologies (ICT).

It has been suggested that assistive technology can reduce social isolation and increase independence [1]. The estimated number of people with dementia worldwide is 27.7 million [2]. As the global population ages the number of people with dementia is also expected to rise. As a result of these demographic shifts, there is a growing interest in technological innovations that can assist individuals with dementia [3].

Maavis is a computer framework that provides greatly simplified access to media, communications, web and programs on a computer. It is primarily designed for people who are either unsure of computers or unable to use them without adaptation. It was designed and developed as part of research into use of technology by people living with dementia.

2 Description

The name Maavis was originally an acronym for "Managed Access to Audio, Visual and Information Services". The Maavis project originates from Sheffield University's Advanced Care Technologies Project as a research project investigating technology use by people with dementia living in a care environment. The principal Investigator was Prof. Peter Cudd, of the Rehabilitation and Assistive Technology Research group. A prototype system was used for field testing and this led to the specification and development of this open source project.

Maavis is a tool for creating screens of buttons containing text or images to perform simple operations when activated (see Fig. 1). Activation can be done with a pointer, keyboard, touch screen or with the built-in scanning support for switch users. Speech support is provided using synthetic Text to Speech to read out displayed text. Screens are arranged in a hierarchy that provides 'activity selection', 'item group selection' and 'item players'. Players are provided for photos, music, information (web pages), video calls and basic AAC. A very simple user login feature is also provided for shared use [4].

Maavis is not designed as an end-user ready application but it is expected that a facilitator will provide a configuration in which photos, videos, music will be placed in the correct folders so that they become available through Maavis to the end-user.

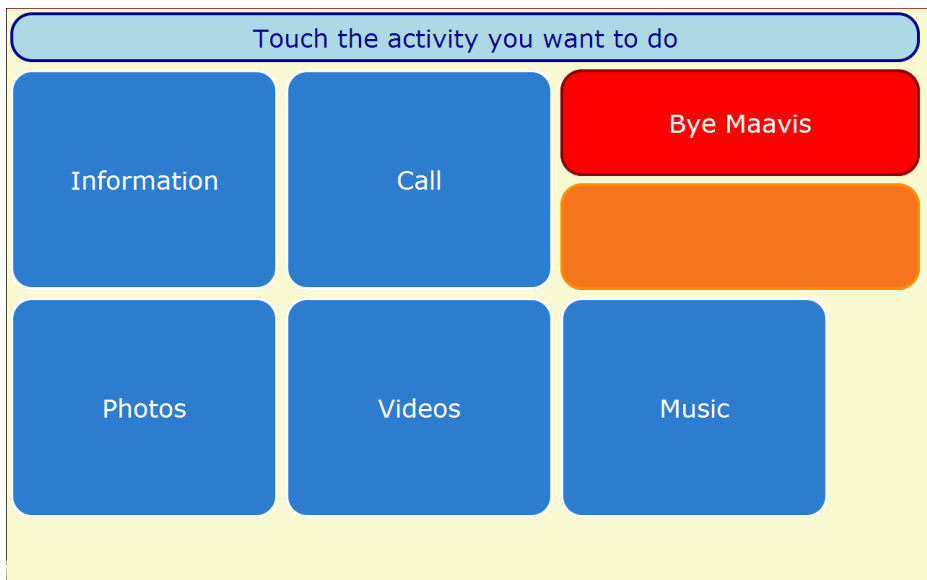


Fig. 1. Maavis interface showing the different options available to a user. The interface is customized for each user.

2.1 Stakeholders

The design of Maavis has kept in mind the people who will be involved and assumed several roles and levels of technical skill [5] :

- End users – no or very little technical interest or experience in IT
- Facilitators – basic IT skills including the ability to get media onto computer copy and rename files
- Technical facilitators – intermediate skills including editing formatted files to update screens and provide web pages.
- Developers
 - Experienced. Ability to create new web pages using XUL (like HTML), JavaScript and CSS
 - Core developers – very experienced – as developers but for platform core, plus possibly Python for Skype integration, C for XPCOM components, Inno setup for installer

3 Design

Maavis builds on other open source technologies, specifically; Mozilla Firefox (PortableApps version), VLC, Outfox and Python. It is implemented as a Firefox add-on, which has full access to the extensive features of the Mozilla Application Framework. The VLC media player plugin for Firefox provides access to most media formats. Outfox provides access to Python software that in turn provides features such as the video conferencing access, and switch access.

4 Usage

The media and programs that users access are easily configured by facilitators including support staff. This is achieved through copying media files into specific folders, where they automatically become available in the choosers and players. Almost all media formats can be played and scalable SVG images such as those from straight-street.com can be used. More sophisticated configuration, such web items or the order of items, can be achieved by editing basic text files. A settings utility is provided using Maavis buttons.

A user can select the activity to perform by touching the particular button and then follow the prompts on the next screen. Fig. 2 shows the interface for viewing photos.

Custom screens can also be designed using familiar web technologies (HTML, CSS Javascript). This affords great flexibility and predefined Maavis features are accessed using extensions to these standard formats.

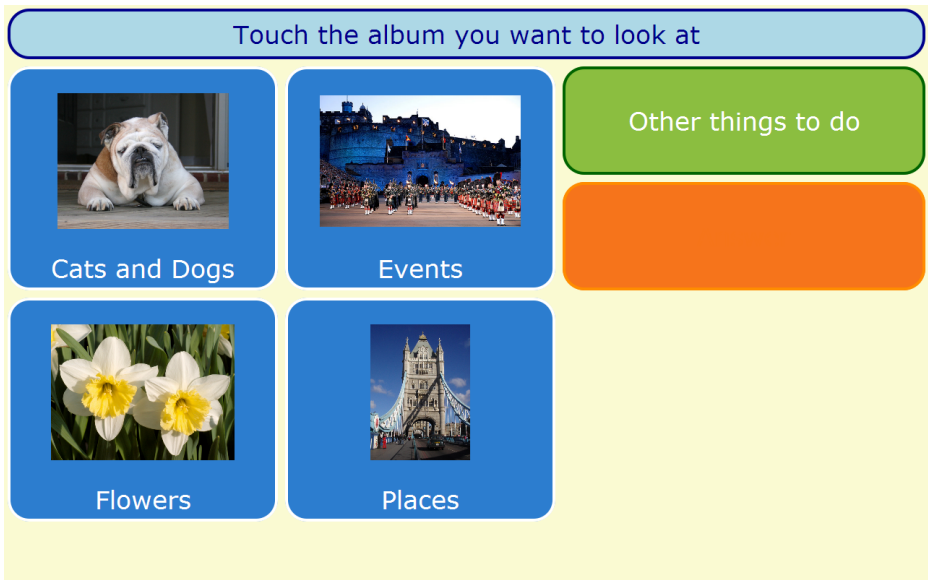


Fig. 2. Maavis interface for viewing photos

4.1 Changing Content That Appears On Screens

In general Maavis screens are arranged into 3 screen levels, providing end users a consistent navigation experience [6]:

- Choosing an activity (Home) – top level screen offering the activity choices
- Activity content chooser (Chooser) – offers selection of the specific ‘topic’ or content
- Interaction controller (Players) – presents the chosen content and media controls

Each button on the home screen leads to a chooser, the buttons on the choosers perform an action such as making a call or running media players with the selected media set.

Each user has a folder with their name as the folders name. This folder will be referred to as the user activities or home folder. Each activity has a folder located in the latter folder, each with a meaningful name (to the user). These folders will collectively be referred to as chooser folders. The files or folders within these folders that are or identify the content for the activity will be known as content files or content folders as appropriate to the activity.

4.2 Setting up Activities

The content shown in each of the choosers is automatically created from the contents of folders under “MaavisMedia”. Samples are provided with Maavis and can be found

in MaavisMedia → Users. In each user activities or home folder you will see a folder for each activity/chooser available to them, in default you will see all the possibilities:

- 1;Photos – contains albums stored in sub folders which contain collections of still images
- 2; Videos – contains “albums” stored in sub folders which contain one or more videos
- Call – contains files whose names identify Skype contacts who can be called or who can call
- Information – contains a file that lists the web/Internet sites that can be visited and operated
- Music – contains albums stored in sub folders which contain collections of audio files
- Programs – contains a file that lists the programs that can be run from Maavis
- Speech – contains communication topics stored in sub folders which contain image files whose names are the phrases that can be generated by the computer

The “1;” and the “2;” prefixes to folder names is a way to allow facilitators to force a particular order of items on Maavis screens. This also works on individual file names.

The names of the folders above have been chosen from the original and obvious use. In fact the type of activity and content is selected by the presence of a file with one of the following filenames `_choosmusic`, `_choosephoto`, `_choosevideo`, `_choosecall`, `_chooseprogram`, `_choosespeech`, `_chooseinfo`. The name of the folder becomes the name of the button on the Maavis home screen and each folder may contain an image file called Thumbnail which appears on the button. So a facilitator is able to choose any name for the activities, e.g. instead of “Programs” it might be more appropriate to use ‘Writing’ if the only programs available allow writing.

Any of the above folders/activities can be completely removed as a particular user requires. Similarly the activities can be added if previously removed or duplicated with a new name. For example, if more than one Internet accessing activity is needed, e.g. in a school it may be desirable to separate Art from Science.

4.3 How Folder Names and Contents Are Used

- All folder names within a user activities folder are used as the text on the button on screen.
- An optional image file called Thumbnail that becomes the image on the button for the folder. Most image formats can be used. Note if no Thumbnail file is present Maavis just displays the name of the folder in the button.
- Image, video or audio files in content folders names are used as the text that appears on the button - along with the image itself when that is the type of file
- The player automatically detects Media or content files. Most media formats except Real are supported.

- A content text file `_items.ini`, which lists the activity, contents and provides access to that content. Each line is of the form “item = value” where value is optional. Item is the name of the item and is shown as the Maavis button text. If an image file of the same name as the item exists it is displayed on the button with the text. The order of the items on the Maavis screen follows the order of the lines in the file. Value depends on the folder the file appears in and may be a skype id, a program filename, a website address or the web address of a media item.

4.4 Videos, Music, Photos

These folders contain subfolders each of which is an album of media content. The audio player and video player play each of the media files in turn in a continuous loop. The audio player allows the user to select individual files to play and uses the media filenames for the button labels. At least for photos instead of multiple media files in the folder there can be a “`_items.ini`” file with website links that are used instead. Note that if the website address becomes invalid the image is skipped.

Presentation order of media files can be forced using the numeric prefixes as shown in the default user install and mentioned in ‘Setting up activities’ above.

4.5 Information

This activity uses the `_item.ini` text file to set up the content. The typical use would require Internet access but web/html pages with a ‘local’ url would always be accessible.

4.6 Speech

This activity is aimed at people who have difficulty making spoken communication. Setting it up is exactly the same as for Photos, but the difference is how the files in the content folders are used. Instead of all of them being presented one after each other, all appear on screen (or if more than 6 on a sequence of more than one screen) in buttons. When one is chosen the text, i.e. filename, is spoken by the computer.

Presentation order can be forced using the numeric prefixes as shown in the default user install and mentioned in “Setting up activities” above.

5 GPII Integration

The integration of Maavis in the GPII is off to a successful start. As part of the Cloud4all project, a functional prototype with several changeable settings was developed and validated. A webcast of Maavis’ integration with the GPII can be found here: <https://www.youtube.com/watch?v=F1ATPYSv02Y>.

During the technical validation, the following items of Maavis and GPII platform were verified and validated:

- Maavis settings that effect the display theme, automatic speech and switch support
- User Listeners
- Lifecycle Manager
- Lifecycle Handler
- Settings Handler
- Matchmaker
- Preferences server
- Test – Maavis startup/shutdown on insertion/removal of USB key and RFID tag.

Details on the GPII architecture are available on the GPII wiki [7].

Two users were created as part of the testing procedure and professional software testers carried out manual testing. Non-functional requirements crucial for Maavis' functioning such as resource usage, memory usage, response time, number of failures, portability were also evaluated.

The results of the technical validation were excellent. Maavis succeeded to operate using different settings each time, meeting different user's needs and preferences. The user listeners were triggered successfully, while a snapshot of the default settings was successfully taken in order to be restored at the end of each scenario. The Settings Handler managed to find, read and change the settings of the required Maavis configuration file.

The first test cycle did not include all GPII functionalities and but did cover most of Maavis options. Future technical validation tests will include much more functionalities and features in terms of users' needs and preferences.

[Note] for a subsequent second GPII integration validation cycle a new high contrast theme was added, along with a simple internationalisation feature providing easy translations of displayed text.

6 Current Status and Future Work

A HTML5 based prototype of Maavis has been created that that implements key features of the original XUL Maavis in HTML5 and also uses W3C widgets [8]. Creating a new version using HTML5 and Widgets allows Maavis to run on the many platforms that have a Web browser. This includes mobile and tablet devices that are becoming increasingly popular with users since they greatly increase the number of locations and situations in which Maavis can be employed.

In the prototype, key functional areas of Maavis performance were targeted and provided with an HTML5 implementation, which proved they could be made to work. Those functional areas were [8]

- Screens of buttons containing text and images and arranged in grids
- Screens with only buttons that provide navigation and selection
- 'Player' screens containing a viewer (or audio player) plus control button sets, specifically for audio, videos, still image slideshows and information (browser).
- A simple speech screen that speaks words when buttons are pressed

- A text-to-speech processor to read aloud screen titles and other information when requested
- Keyboard access (tab and enter keys to move around and activate screen options)

This prototype demonstrated that a usable HTML5 version of Maavis can indeed be created. However, certain challenges still remain [8].

- **Browser Support for HTML5:** Perhaps the biggest challenge at present is the variation in browser support for HTML5 and related technologies. In fact, as HTML5 will never be a fully completed specification, but is, rather, a continuous evolution, this may never be completely resolved.
- **Security Issue with Cross-domain Access:** The browser security concept of same origin policy restricts access to DOM from script on pages in a different domain. When using several widgets, the impact is that code in one widget cannot manipulate another. This means widgets loaded from different sources cannot easily communicate with each other on the client side.
- **User Control of Web Page Display:** The information viewer raises a difficulty that does not occur in the original Maavis application which shows the Web page in an embedded browser element that is only available in XUL. The control buttons are scripted to control this browser element for pan and zoom. In the HTML prototype the same origin policy means that the control script cannot manipulate the displayed Web page.
- **Support for Accessibility Switch Users:** The original XUL Maavis provides built-in scanning support to allow control with simple switch devices (briefly a highlight moves between user interface elements until a switch is operated by the user to select or activate that item). Currently browser standards support very limited input devices, namely pointer + click and keyboard, and events (pointer and keyboard), so switches cannot easily be used without extra assistive technology software.
- **Keyboard Access Issues:** Another observation is when using tab key access to move between elements iframes are tab stops themselves, and so receive focus before subsequent navigation into the contained widget elements.
- **Embedded Text-to-speech Support:** Synthetic text to speech processing is problematic as that is no standard platform-independent way of accessing speech from a browser in order to create self-voicing HTML applications.

7 Conclusion

Maavis provides individuals with cognitive disabilities a simplified interface to access media, communications, web and programs on a computer. Individuals who are generally not comfortable with computers have also benefitted from Maavis' simplified interface[9]. Maavis has been undergone a successful initial validation and is being integrated in the GPII. A HTML5 prototype of Maavis has been developed to allow it to run on multiple platforms but challenges remain. However, with the availability of newer APIs and tools Maavis will soon have access to new HTML and platform

features, thereby providing the opportunity for innovative alternative access to media and communications.

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