Towards General Cross-Platform CCF Based Multi-modal Language Support

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Abstract. The AEGIS project aims to contribute a framework for, and building blocks for, an infrastructure for "open accessibility everywhere". One of many objectives has been to research, prototype and test freely available software services for inclusive graphical symbol support as part of mainstream ICT environments. Based on the Concept Coding Framework (CCF) technology, a "CCF-SymbolServer" has been developed. It can be installed locally on any of the major desktop platforms (GNU/Linux, MacOS X and Windows) to provide its multilingual and multi-modal representation services, or online to support many kinds of web services and networked mobile systems. The three current AEGIS applications will be presented: 1) CCF-SymbolWriter, an extension for symbol support in LibreOffice/OpenOffice Writer, 2) the new CCF supported version of Special Access to Windows (SAW6), 3) CCF-SymbolDroid, an AAC app for Android mobile devices. User evaluations and future perspectives will be discussed.

Keywords: AAC, AT, accessibility, graphical symbols, literacy, cognitive impairment, open-source.

1 Why AAC Is, and Should Be, Going Mainstream on Standard ICT Platforms

Until now, ICT support for individuals who need AAC has typically been provided in the form of dedicated software and/or devices. Although there will still be room for such, there are a growing number of reasons for a decisive move towards providing AAC functionality as part of standard mainstream ICT products:

- ICT products and services (such as smart-phones, tablets and mobile communication services) have rapidly become an integrated and often predominant part of everyday life, and acquire more general features (portability and usability combined with computing power for running full-featured multi-media apps, larger displays of excellent quality etc.) making them suitable and desirable for AAC needs. It is natural that both users and their environment expect and request that a wide range of needs, including the specific ones in the area of AAC and language support, should be well accommodated as part of these mainstream products.

- Some previously special functions of Assistive Technology (AT), such as text-to-speech synthesis, are gradually becoming mainstream technology.
- A solid infrastructure of flexible multi-modal and multilingual language representation technology is needed for good AAC support. There are potentially substantial advantages of such an infrastructure going mainstream, both in terms of inclusion and participation, and in terms of cost and availability – in particular where resources are scarce. More and more parents, (pre-school) teachers and others discover that access to synthetic speech and a range of graphical symbol representations are great for most learners at some stages in early literacy development and early new language learning. This is particularly the case in multi-cultural and multilingual environments.

Some of this integration is now rapidly happening as AAC software is being developed for and/or migrated to mainstream mobile devices in the form of mobile "apps" (though generally still with more limited or specific functionality than traditional dedicated AAC applications and devices). Though this is primarily only integration on the mobile device level, the consequences are still expected to be profound by experts in the field [1]. However, AAC and symbol support within standard activities and services is still a major step to be taken. The Widgit products "Point" and "Insite" [2] are early examples of more integrated symbol support on the Web.

2   Preconditions for Inclusive AAC Support in Mainstream ICT

To allow AAC methodologies and ICT tools to go from special to mainstream, there is a need for an infrastructure for inclusive and integrated graphic symbol (and signing) representation of content and meaning in standard software environments. These infrastructural tools need to be based on open standards, be widely and freely available, and be multilingual and multi-modal so that more language representations may be added subsequently and in a distributed manner by local stake-holders. Components and tools need to be available to make it easy to provide the multi-modal support in a widening range of different services.

There are of course some more fundamental conditions and limitations that will create difficulties for AAC support in some environments and services. On the technical side, for example chat and messaging protocols are not supporting graphics. It is essential that a discussion is initiated around how such limitations may be overcome to allow future multi-modal communication also via these channels. There are different possible longer and shorter term ways to overcome these restrictions, such as: a) adding support for graphics in some of these standards, or; b) providing support for some graphic libraries packaged as private area Unicode fonts. This latter method is now successfully used in the AEGIS CCF development for LibreOffice/OpenOffice Writer (see below) [3], [6].

But the purely technical obstacles may not be the most difficult ones. We are facing major challenges in terms of attitudes, predominance of proprietary resources, and the lack of well established open standards and resources for multi-modal and multilingual vocabulary interoperability.

It will be a major task in the coming years to address these challenges in order to improve the preconditions for progress. We hope that the CCF based developments within the AEGIS project [3] may serve as a platform and inspiration for further European and international co-operation to this end. In addition to the European programs and the international standardisation bodies, it seems sensible to link such work to developing international frameworks like "Raising the Floor" and "GPII" (Global Public Inclusive Infrastructure) [4].

3   The AEGIS Project Developments

The AEGIS project's [3] overall goal is to contribute with vital elements of an infrastructure for "open accessibility everywhere". A wide range of user needs and technology platforms have been addressed. One of the many objectives has been to research, prototype and test freely available software components for inclusive graphical symbol support as part of mainstream environments to benefit people with communication, cognitive and multiple impairments. This has resulted in the development of a "graphical symbol server" based on the Concept Coding Framework (CCF) technology [5].

The "CCF-SymbolServer" is implemented in Java, and can provide multilingual and multi-modal representation services locally on any of the major desktop platforms; GNU/Linux, MacOS X and Windows. It can also run as an online webserver, to serve many kinds of web services and mobile devices (Fig. 1.).
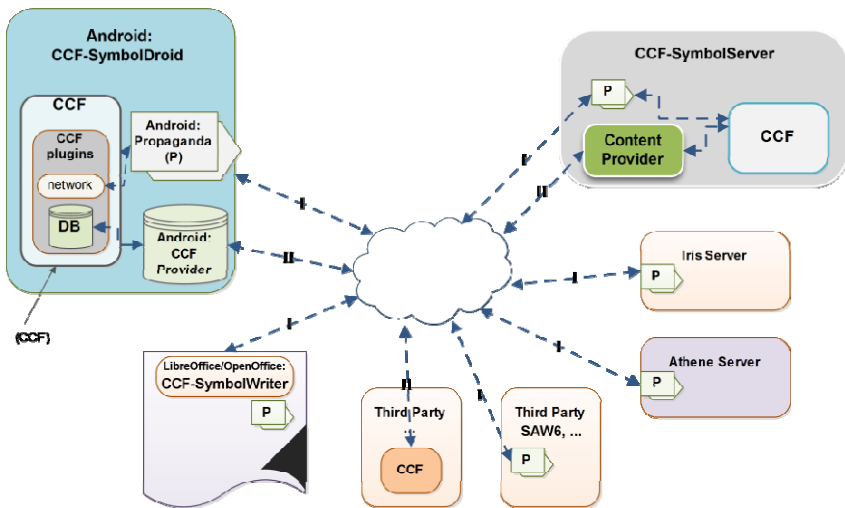

Fig. 1. The CCF-SymbolServer (top right) together with its current two major clients (CCF-SymbolWriter and CCF-SymbolDroid) and other existing (SAW 6) and potential interacting 3rd party software services.

Currently two symbol systems (Blissymbolics[6] and ARASAAC[7]) and four languages (English, Swedish, Spanish and Dutch) are supported, and the design is open to add more. A word in a given language can be sent to the CCF Server. The server will look up possible meanings or concepts in its databases, and return these as Concept IDs with available possible symbol representations. Fig. 2 below shows the Graphical User Interface (GUI) of the CCF-SymbolServer, installed and running locally on a desktop system. It is configured to support English together with Blissymbolics and ARASAAAC symbols, and has here received and looked up the word "horse". The concept information is displayed in a verbose format together with the found symbol representations. If the concept ID is known, the SymbolServer can directly return alternative representations in other languages and symbol systems.
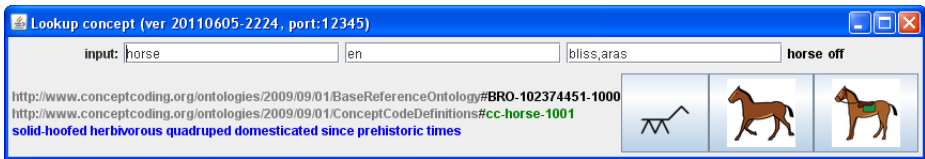
Fig. 2. The CCF-SymbolServer's GUI window, running in a verbose configuration on a desktop system

Three applications interacting with the CCF-SymbolServer have been developed within AEGIS:

1. CCF-SymbolWriter, an extension for symbol support in LibreOffice/OpenOffice Writer[8]. It allows graphical symbol support for several kinds of needs: **a)** the needs of struggling text users to support and confirm comprehension while writing and reading text, often in combination with text-to-speech (TTS) support (see Fig. 3 below); **b)** the needs of AAC (Augmentative and Alternative Communication) symbol users to have access to full symbol representation (as far as possible) with symbols displayed on top of each word (see Fig. 4 – right nand side - below); **c)** the needs of helpers (parents, teachers, therapists etc.) to support users by preparing and presenting documents with graphic symbol support

2. A new CCF supported version of Special Access to Windows (SAW 6) [9], an advanced free and open-source on-screen-keyboard application that allows the creation of symbol selection charts for the control of any mainstream program on a Windows system

3. CCF-SymbolDroid, an AAC app for Android mobile devices, with the following functionality: **a)** Face-to-face AAC with graphic symbols, text and the system speech that is available on the device; **b)**AAC for indirect communication via messaging in several forms; **c)** Access to the full CCF vocabulary database via the online CCF-SymbolServer; **d)** Log in with user ID to access the online CCF-SymbolServer services - save, restore and share local set-ups via the server (the Iris and Ithene server services in Fig. 2. above); **e)** Integration with Tecla Access[10] for alternative input control

Here follows a somewhat more detailed presentation of these three applications.

3.1 The CCF-SymbolWriter Extension for LibreOffice Writer

CCF-SymbolWriter – is a free and open source software package for graphical symbol support in Libre/OpenOffice Writer on all its supported platforms. It consists of the locally installed CCF-SymbolServer and an extension for Writer, providing the option of graphic symbol representations of words contained in, or entered into, the document text. The key innovations of the CCF-SymbolWriter suite are; a) the application of the free and open source Concept Coding Framework technology for the provision of multilingual and multi-modal language support through graphic symbol representation in a standard and free office software environment on all major operating system platforms; and b) the underpinning CCF-SymbolServer technology allowing for future distributed application in other software, and for a growing range of languages and symbols and signs libraries to be added by different stake holders over time. Existing corresponding state of the art alternatives are all special   proprietary software implementations, e.g. Widgit "SymWriter" and "Communicate: In Print" [2]. The intended uses of   the CCF-SymbolWriter package are a) for users with cognitive difficulties and users who in general have problems in their interaction with text, to help with text production and text comprehension, by adding a graphic symbol representation modality (in addition to text only – and text-to-speech if available); b) for information providers who want to provide better access to text content for target users with the help of graphical symbol representation; c) for parents, teachers, assistants who need this as a tool to support users (from children to adult) in their literacy development; d) for 3rd party software and symbol library developers who want to use the CCF Symbol Server for allowing flexible graphical symbol support for a growing number of languages, symbol resources and software implementations.

More is found below about SAW 6 as a first 3rd party software implementation of the CCF symbol support done within AEGIS.
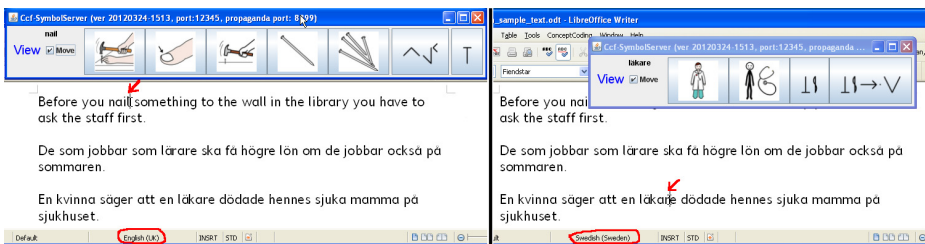

Fig. 3. LibreOffice Writer with the CCF-SymbolWriter extension in "View only" mode. The word currently in focus is looked up and displayed by the CCF-SymbolServer. Left; focus in the English, and rigth; focus in the Swedish section of a multi-language document.

Software installation downloads and preliminary end user documentation for CCF-SymbolWriter are found at:

`http://dev.androtech.se/ooo/content.html`.

The home of the full open source project release will be decided during the summer of 2012 – probably `www.conceptcoding.org` or/and at SourceForge.

3.2   SAW 6 – Special Access to Windows – with CCF Support

SAW6 – Special Access to Windows version 6 (with WindowCatcher) is a major update and merge of the two open-source applications SAW5 [9] and Window-Catcher, which provide a highly configurable and scriptable on-screen-keyboard (OSK) assistive tool for users with motor impairments, and for inspection and interaction with the UI of accessible target applications via the MSAA and UI-Automation accessibility APIs respectively.

SAW 6 is now upgraded to full compatibility with Windows 7, including the 64 bit version, and with full Unicode support. Dedicated language neutral word-prediction and abbreviation expansion has also been added, together with several other minor improvements since the SAW 5 version. SAW6 presents two key innovations:

— the integration of WindowCatcher, resulting in the to our knowledge first OSK in Windows capable of direct interaction with target applications via the MSAA and UI-Automation accessibility API:s [11]
— the added capability to interact with the CCF-SymbolServer, resulting in unique features for creating and maintaining multilingual and multi-modal symbol supported on-screen selection charts. Fig. 4 – left – below shows SAW 6 in set-up mode, interacting with the locally installed CCF-SymbolServer to look up symbols for the English word "angry". Symbol charts may later be semi-automatically translated between the supported languages and symbol representations.

This, among many other things, allows AAC symbol users to better interact with text based standard applications as well as with target applications that also make use of the CCF technology, such as LibreOffice Writer with the CCF-SymbolWriter extension.
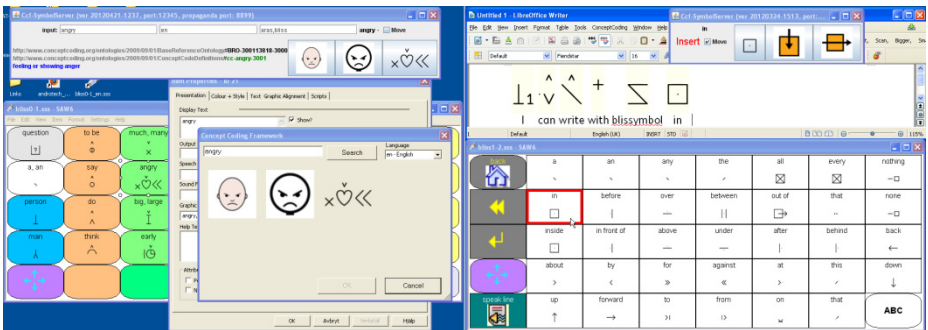

Fig. 4. These two screen captures show (left); SAW 6 in editing mode, retrieving symbol representations by word-to-concept-to-symbol lookup via the CCF-SymbolServer (shown on top), and (right); input of words from a SAW symbol selection chart into LibreOffice Writer with symbol insertion from the CCF-SymbolWriter extension in Symbol Insert mode

SAW6 will be available as free software, e.g. at www.oatsoft.org. It is expected to establish a new benchmark for free and open-source OSK solutions in general, and in some aspects for the OSK segment as a whole.

3.3   CCF-SymbolDroid – AAC App for Android Mobile Devices

CCF-SymbolDroid mobile AAC app enables the user to create symbol messages for direct person-to-person communication, or to communicate remotely via text messaging, email, and directly to other registered users via a dedicated webserver. It can make use of standard text-to-speech (TTS) installed on the device, and it will be compatible with the Tecla Access app and Tecla Shield hardware [10] for alternative input for persons with physical limitations (see example screen shots in Fig. 5 below.)

The CCF-SymbolDroid is, when this is written, a prototype version moving towards beta. A release version will be available on Android Market by summer 2012.

The key innovations of the CCF-SymbolDroid is that's it's a first mobile AAC app built on the multilingual and multi-modal CCF technology, that it's based on communication through standard communication channels such as network (TCP/IP) and SMS, and the possibility to synchronize and interact with an online CCF-SymbolServer. Features include sharing of symbol maps as well as individual settings which can be accessed via the cloud based the "CCF-SymbolCloud" services. The interchangeability between different symbol languages or natural languages is specific for the CCF technology. A section of the private Unicode range is also planned be used to map concept codes, so that they can be transmitted over any text channel.

Fig. 5. The **CCF-SymbolDroid** communicator app – 3 screens with ARASAAC and Blissymbols in runtime mode to the left, and in settings and editing mode to the right

Software installation downloads and preliminary end user documentation for CCF-SymbolDroid are found at

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http://dev.androtech.se/ooo/content.html.
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4   Conclusions

The longer term CCF perspectives include:

The work to integrate the CCF technology, as well as the graphic language of Blissymbolics, as part of the ISO TC 37 multi-modal terminology standards, has only been initiated within AEGIS. It will continue beyond the duration of the project.

The general maintenance of the CCF vocabulary resources is a long-term commitment to further refine of the support for the current languages and representational resources, and to subsequently add new ones.