Sometimes, people on TV speak so quickly that it is difficult to understand what is being said. The fast dialog undermines comprehension and enjoyment of our favorite programs. This is further complicated with the fact that different shows or movies have distinct acoustic profiles or are in a second (foreign) language which results in varying intelligibility. With so many variables, it befits TV manufacturers to offer features allowing TV viewers to personalize the audio-video to enhance understanding of what they hear and watch.

*EasyWatch™* improves intelligibility of speech for all viewers, and particularly those with disadvantaged auditory or cognitive function. Problems of understanding speech occur more frequently while viewing movies and talk shows versus newscasts and documentaries which place a priority on speech cadence and annunciation. Hence, *EasyWatch* may be especially beneficial for comprehending movies and talk shows. It is language independent and works equally well with Western and Eastern tonal languages.

1. EasyWatch™ technology

1.1. Synchronization of audio/video

In today’s systems the speed of video playback defines the speed of the audio. In other words, video is the master (see Figure 1 below). Almost all video players and online video services allow the user to change the video playback speed relative to the original video speed. The audio speed is modified according to the video playback speed.
In a system where video is the master, the audio content is not analyzed. Silence, noise, and music are treated with equal merit to speech. To improve intelligibility, we need only slow down the speech segments. Slowing down of irrelevant sounds unnecessarily increases the duration and may even produce artifacts on music and other non-speech segments. Humans are more sensitive to audio artifacts than video artifacts. Speed change with audio as slave will exacerbate distortions and degrade intelligibility.

*Figure 1*

With **EasyWatch™** the audio is the master (see *Figure 2*). Audio and the corresponding video speed can be controlled according to the audio content. The audio and video streams are split, the audio is analyzed and adjusted, the video (the slave) is correspondingly adjusted, and then the streams are recombined into the modified audio/video stream. This allows for flexible speed modifications:

- Only segments of the audio/video stream containing voice can be slowed.
- Non-voice segments of the video can be sped while voice can remain unaltered for instances when one desires to speed up a program without compromising dialog clarity.
- Voice segments of the audio/video can be slowed while non-voice segments can be sped up to compensate for the delay accumulated during the voice segments. This enables improved intelligibility of real time video streaming without accumulating large delays.

Furthermore, the algorithm will only slow-down audio and voice segments where there is no danger of producing artifacts.
1.2. Adjusting audio speed

The Audio Speed Changer block is shown in Figure 2. This block is expanded to show its constituent parts in Figure 3: Audio Content Analyzer, Audio Speed Controller, and Time-scale Audio Processor.

The purpose of Audio Content Analyzer is to detect and identify time segments corresponding to different types of the audio signal or their mixture (e.g., silence, noise, music, voice). This classification may be extended. For example, voice segments can be subdivided on monologs and dialogs. New segment types such as “sound effect” may be introduced. And a special “unknown” type can be used to designate segments that cannot be clearly identified and labelled. The Audio Content Analyzer receives the pure original audio signal extracted from the video and produces time stamps designating the beginning, ending and type of the segment.

The Audio Speed Controller determines what time scale modification shall be performed by the Audio Speed Changer block. For example, silence or noise segments can be sped up (shortened), voice segments slowed down (stretched), and music segments preserved in their duration. The decision may depend on the user preference, type of application, and the accumulated delay produced by the Audio Speed Changer block.

The purpose of the Time-scale Audio Processor block is to speed or slow an input audio signal without affecting the frequency content, such as the perceived pitch of any tonal components.
For example, the output of speech should sound like the speaker is talking at a slower or faster pace, without distortion of the spoken vowels.

**Figure 3**

![Diagram of audio speed changer and processor]

2. **SEN\textsuperscript{TM} technology**

\textit{EasyWatch\textsuperscript{TM}} technology, described in the previous section, is based on Alango \textit{EasyListen\textsuperscript{TM}} technology. In \textit{EasyWatch Player} V.2.0 one more Alango technology was integrated. It is called \textbf{Sound Effect Normalization} (SEN for short). Similar to \textit{EasyListen\textsuperscript{TM}} technology, \textit{SEN\textsuperscript{TM}} is designed for improving intelligibility of a human dialog in video.

\textit{SEN\textsuperscript{TM}} technology is based on suppressing stereo sound effects while preserving the speech. It leverages the fact that within a stereo mix, the main voice or dialogue is positioned in the center, while sound effects are panned to the sides (or move spatially across the mix).

\textit{SEN\textsuperscript{TM}} is designed to work with stereo sound. It works under assumption of typical film soundtrack mixing techniques and conversions, where speech is typically placed as a mono signal in the center channel, while sound effects (except for the LFE), ambiences and music are panned out to other channels. When such a soundtrack is downmixed to stereo (for instance, for television), this results in perfectly correlated mono speech (identical signals for left and right channels) and less correlated ambiences and stereo sound effects that are panned out to the sides.
3. EasyWatch Player

3.1. Main window

EasyWatch Player is the video player developed for testing technologies described in section 1 and section 2. The main window of this application is shown below.

Figure 4

The central part of this window is the video viewer:

Figure 5
At the left side of the main window (see Figure 6) is the list of media items with configuration file controls (see section 3.6 for more details).

Media items list helps you to get video from the set of video files that you selected for using. Each video item has a button with a small video viewer placed on top of it. When you push one of these buttons the corresponding video is placed in the main video viewer (see Figure 5). The active media item has a blue frame (the third media item in Figure 6).

You can save/load all the information about the list of video items in configuration file (see section 3.6). At the top of media items list (see Figure 6) you can see three small icons – Save, Load and Delete.

Save button (with diskette icon) is for saving current configuration into configuration file. If you want to load configuration that you saved in some configuration file, click Load button (with hourglass icon). To clean up all video items from current configuration, click Delete button (with cross icon). If you want to delete one media item, select it and use Ctrl+Delete keys.

The default configuration file is the file easywatch.xml. It is placed in the main folder of EasyWatch Player. However, you can save/load your configurations in any other file wherever you like. See more information about EasyWatch Player configuration in section 3.5 and 3.6.

Below the media items list there are four buttons – Help, Feedback, Browse and Settings (see Figure 7).

Help button opens EasyWatch Player User Guide in you default pdf-viewer (if you don’t have pdf-viewer on your computer you can download Acrobat Reader from Adobe website).

Feedback button launches your default browser to show you Feedback Page on Alango website. Please, share with us your opinion about the technologies implemented in EasyWatch Player. We need you feedback.
The other two buttons - Browse and Settings – are related to functionality of EasyWatch Player.

If you push Browse button you launch Load File Dialog, which can be used to add video file (or files) to media items list.

If you push Settings button you launch Settings Dialog. In this dialog you can set all parameters of the algorithms mentioned in section 1 and section 2. These parameters are described in more details in section 3.5.

At the bottom of the main window (see Figure 4) there are principal controls for working with the application.

Let’s list these main controls (more detailed description see in sections 3.7 and 3.8):

1. **Start** button - use this button to start playing video.
2. **Pause** button – use it to pause video that is playing. Click Start button to continue.
3. **Stop** button – this button stops movie and returns to the beginning.
4. **Progress bar** indicates (in green) the part of the video that was already played and the delay (in blue) comparing to the video that is running without the EasyListen delay.
5. **Current time** of the running movie (hours : minutes : seconds . milliseconds).
6. Accumulated delay time at the current video position.
7. **Set bookmark** button.
8. Current **video frame number**. It may be used to set start frame number.

9. **Bookmarks** (there may be up to 9 bookmarks for each media item).

10. Progress slider to show current **video position** (or to set start video position).

11. Total **number of video frames** in current movie.

12. Slider to set **volume of the sound**.

13. **Voice Stretch** to define maximal limit of slowing down voice segments.

14. **Switch on/off EasyListen** slowing down process.

15. **Switch on/off SEN** process.

3.2. Install/uninstall

To install **EasyWatch Player** V.2.0 you should use installer file **EasyWatch Player V.2.0 (Beta 1).exe**. Run this installer and start with the **Welcome** dialog presented below:

*Figure 9*
Then follow instructions of this **Setup Wizard**.

The first dialog after **Welcome** dialog is the **License** dialog (see **Figure 10**). Read **End-User License Agreement**, click **Accept** radio button and push **Next** button.

**Figure 10**

The next to **License** dialog is the **Folder** dialog (see **Figure 11**), where you can set the folder to install **Easy Watch Player**.

This dialog is followed by the **Select Additional Tasks** dialog (where you select whether to create the desktop icon).

The next dialog is **Ready to Install** dialog (see **Figure 12**).

Click **Install** button to start installation.

**Figure 11**

**Figure 12**
After few seconds you receive **Information** dialog (where you can read contents of the **ReadMe** file), and at last you receive **Exit** dialog (see **Figure 13**).

**Figure 13**

![Figure 13](image)

Click **Finish** button to finish installation.

After installation is finished you have the **EasyWatch Player** icon on your desktop, and **EasyWatch Player** item among **Recently added** items of the Windows **Startup menu**.

Besides this, the same menu item will be on the letter **E** in Windows **Startup menu**.

**Figure 14**

![Figure 14](image)
If you decide to uninstall **EasyWatch Player**, click the **Uninstall** item from the Windows **Startup menu**. (see **Figure 14**). Thus, you launch standard Windows uninstall tool. You just need to select **EasyWatch Player** item in the list of installed programs and then click **Uninstall** button at the top.

**Figure 15**

3.3. **Start using EasyWatch Player**

To launch **EasyWatch Player** you can either use corresponding desktop icon or use **EasyWatch Player** item from the Windows **Startup menu** (see **Figure 14**). After the first launch of **EasyWatch Player** you receive the main window of the application with the default **list of media items** and empty **main viewer** (see **Figure 16**). These are three sample movies you get with installation (see section 3.4).

To add more movies to the **list of media items** (see **Figure 7**) you can either use **Browse** button (see **Figure 7**) or just drag some video file (mp4 video type is supported) either into the **media items area** at the left side of the application or to the **main viewer area** (see **Figure 17**).

You can drag either single file or select in some folder a group of files and drag all of them at once. Similarly, if you use **Browse** dialog, you can select there either a single video file or a group of video files.
Figure 16

Figure 17

Drag and drop
The current version of EasyWatch Player has some limitations. One of them is that application works only with mp4-files and video must have frame rate not more than 60 fps (frames per second).

When you added some video file (or files) to the media items list, this file appears in the main video viewer (see Figure 5). You can select some other video in the media items list to make this video ready for running. After that click Start button (see Figure 8) to start movie.

### 3.4. Sample video files

Installing EasyWatch Player you also install some sample video files that you can use for testing EasyWatch™ technologies. They are in the video subfolder of the main folder, where you installed EasyWatch Player.

![Figure 18](image)

### 3.5. Settings

When you create a new media item, as it is described in section 3.3, this media item receives default set of parameters. You can change each of these parameters in the Settings dialog.

This dialog has three tabs.

In the first one you can set all EasyListen™ parameters.
In the second tab you can set SEN parameters.
In the third tab you can set some additional parameters.

*Figure 21*

The **Bookmarks** group of controls allows you manipulate with bookmarks (see section 3.8 for more information about bookmarks).

The **Repeat video** check box defines whether you run video in infinite loop (if this check box is checked), or you want stop it after the end and return to beginning (if it is not checked).

The **Output video file** group of controls may be used if you want not only play video (with corresponding EasyWatch™ and/or SEM™ processing), but also write the results of the processing into some new mp4-file. Use **Write output video file** checkbox to set writing output file. The default output file folder is the same as the folder of input video file. The default output filename is the same as the name of input video file with adding postfix _EW at the end of file name. But you can set some different name and choose different output folder.

### 3.6. Configuration file

When you launch **EasyWatch Player** it loads default configuration file easywatch.xml from the main application folder (the folder where you installed the application).

You can also load/save configuration using some other configuration file (with any name and any location). Use for this purpose **Save** and **Load** buttons (with diskette and hourglass icons) at the top of media items list (see Figure 6).

The **configuration file** is an XML file. The default configuration file easywatch.xml is presented in the following sample (see Figure 22 below).
In this configuration we have three media items.

The first one corresponds to the video file DavidSRose_2007U-480p-en-A-60fps.mp4.

The second one corresponds to the video file MarkWahlbergOnTNF_A-60fps.mp4.


All three video files are on the path C:\Alango Technologies\EasyWatch Player V.2.0 (Beta 1)\video\.

The sound volume of all items is set to half of maximum (50%).

All media items have no bookmarks.

All media items are set to play without infinite loop (with stop at the end).

And all items have the default set of EasyListen parameters and the default set of SEN parameters.

All these parameters may be changed either directly in xml-file or in the Settings Dialog.

3.7. Playing with EasyWatch

Now let us play a little with EasyWatch application.

Figure 23

When you launch EasyWatch Player it reads its configuration from the default configuration file easywatch.xml. As a result, you see content of media items list at the left side of main windows (see Figure 6).
Suppose you click the third media item and loaded third video into the main viewer. Now you can push **Start** button (control 1 in Figure 8) and start playing this movie.

While playing video you can change **sound volume** (control 12 in Figure 8), change **stretch factor** (control 13 in Figure 8), and **switch on/off delay process** (control 14 in Figure 8). You can also use processing slider (control 10 in Figure 8) to change current video position.

You do not need to pause/stop video for using these controls.

Besides this, while playing video you can set **bookmarks** (see section 3.8 for more details) by pushing **bookmark button** (control 7 in Figure 8).

During playing video you also get some information about video processing

**Figure 24**

Progress bar (control 4 in Figure 8) shows you current **video position** (in green) and current **accumulated delay** (in blue).

At the right of the progress bar you can see two time-controls (controls 5 and 6 in Figure 8). The green one shows the **current movie time**. The blue one shows the **accumulated delay**.

Below progress bar you can see **progress slider** (control 10 in Figure 8). While playing video its handle is moving from left to right synchronously with green progress bar.

At the left of the progress slider you can see current **video frame number**. At the right you can see the **total number of video frames**.

### 3.8. Bookmarks

**EasyWatch Player** provides useful functionality – **bookmarks**. This tool helps you to set some positions in video and switch easily from one position to another.

You can set a bookmark either while video is playing or while it is paused/stopped.
To set a bookmark you should push the bookmark button (control 7 in Figure 8). After that you will immediately see a small blue rectangle with a number inside it just below the handle of the progress slider.

The alternative way to set a bookmark is to use a Settings dialog (see Figure 21).

To add a bookmark in this dialog you should set the video frame number in corresponding combo box and push Add button at the right to this combo box.

In the same combo box, you can view the list of frame numbers corresponding to all bookmarks.

If you want to delete some bookmark, select corresponding frame number in this combo box and push Delete button (right to the Add button).

If you want to delete all bookmarks of the current media item, push Delete all button.

One more way to add/delete bookmarks is to use keyboard (see section 3.9). Key Insert adds new bookmark in the current video position. Key Delete deletes all bookmarks of the current media item.

3.9. Hotkeys

You can operate with EasyWatch Player not only using mouse but using the keyboard as well. Each function of this application has a corresponding hotkey.

The main four keys are:

**F1** – launch Help dialog.

**F2** – start video processing.

**F3** – pause movie.

**F4** – stop movie.

If you press F1 key on the keyboard, you get the Help dialog with the list of all hotkeys (see Figure 25).

The next four hotkeys set focus to corresponding controls, which allows to operate with them using keyboard:

**F5** – set focus to current frame number edit control (control 8 in Figure 8). After that you can set the video frame number you need.
**F6** – set focus to *video processing* slider (control 10 in Figure 8). After that you can move handle of this slider using *arrow* keys, *Page Up / Page Down* keys, and *Home / End* keys.

**F7** – set focus to *sound volume* slider (control 12 in Figure 8). After that you can move handle of this slider using *arrow* keys, *Page Up / Page Down* keys, and *Home / End* keys.

**F8** – set focus to *stretch factor* combo box (control 13 in Figure 8). After that you can choose required stretch factor using *arrow* keys.

*Figure 25*

Four more **F**-keys are available:

**F9** – switch on/off *EasyListen processing*. This is the same as using button 14 in Figure 8.

**F10** – switch on/off *SEN processing*. This is the same as using button 15 in Figure 8.

**F11** – launch *Settings dialog* (see section 3.5).

**F12** – launch *Browse dialog* for loading new video file.
The next three hotkeys correspond to **media items list**. They use **Ctrl** key:

- **Ctrl + S** – launch **Save dialog** to save **media items list** information in some **configuration file**.
- **Ctrl + L** – launch **Load dialog** to read **media items list** from some **configuration file**.
- **Ctrl + C** – clean up **all** media items.
- **Ctrl + Delete** – remove **selected** video item from media items list

The next group of hotkeys corresponds to operations with **bookmarks**:

- **Insert** – add bookmark in the current video position.
- **Delete** – delete **all** bookmarks from the current video.
- **Alt + 1, Alt + 2, Alt + 3, ...** - moves video position to the bookmark with the given number.

Note, that **not more than 9 bookmarks** are supported.

At last, you can use hotkeys **Ctrl + 1, Ctrl + 2, Ctrl + 3, ...** to switch from the current media item to the media item with the given number.

### 3.10. Tooltips

Each control of **EasyWatch Player** has a **tooltip** – when mouse is above this control you can see a short explanation of this function.

At the beginning of each tooltip there is a reminder of its hotkey. Then follows short description.

For instance, tooltip of the **Start** button is “F2 – Play”.

**Figure 26**

![Image of tooltips]

Tooltips of **media item** buttons looks different:
At the left of the tooltip you can see the index of media item. At the right you see all settings parameters (see section 3.5 and 3.6) of this media item – the full path to corresponding video file is at the first line, EasyListen parameters are at the second line, and SEN parameters are on the third line.