nordicAktiva

Syntax Description

Version 1.3.0



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# Aim

nordicAktiva is a software to present the visual and auditory stimuli to the patient. This document describes the syntax used in the Paradigm Description File.

# Paradigm Description File

The paradigm description file describes the experimental procedure. It is in XML-format and can be edited outside nordicAktiva by any plain text editor or specific XML editor.

nordicAktiva checks for Paradigm Description files in a default folder. This folder can be opened and browsed by selecting “Browse common paradigms…” from the “File” menu in nordicAktiva.

Additionally, a second location for paradigms is defined for each user. This folder can be opened and browsed by selecting “Browse user paradigms…” from the “File” menu in nordicAktiva. Paradigms the user has created or modified (i.e., paradigms which are not part of the distribution) can be saved in this location and will not be affected by an upgrade of the program.

The name of the paradigm description file has to be identical to the name of the folder it is placed in. That means that you will need to have a folder for you paradigm named e.g. “ParadigmExample”, and within this folder the main paradigm file must exist and be named “ParadigmExample.xml”. Otherwise, nordicAktiva will not recognize this paradigm and will not display it in the drop down menu.

# Overview

Paradigms contain several parts to be complete. Some parts are required for the paradigm to run, other optional to add extended functionality or flexibility.

The paradigm can be roughly grouped into 4 main parts that again might have several sub-parts consisting of one or more defined xml-tags.

1. Main Settings
   1. Settings (required)
   2. Variables
   3. Languages
   4. Versions
   5. Defaults
2. Definitions
   1. Colors
   2. Position
   3. Conditions
3. Stimulus
   1. Slide (required)
   2. Trial (required)
   3. Block
   4. Session (required)
4. Post-processing definitions

The handling of various languages and versions is implemented using include files. This is detailed in section 4.5 Include.

# Description of the syntax

## Main Settings

### Settings

In the Settings, general information about the paradigm is listed.

* Name: Name of the paradigm to appear
* Instruction: An additional instruction to the patient. One or several .pdf, .doc or .txt files can be listed.
* Description: A short description to appear in the nordicAktiva GUI for the experimenter. It should give a short summary about the paradigm, its duration and on how to run it.
* Slices: Suggested number of slices
* TimeToRepeat: Suggested TR time for the EPI sequence
* TimeOutLengthForScannerPulse: Use this tag if you want Aktiva to stop running the paradigm if there is no scanner pulse in the expected time (TR + TimeOutLengthForScannerPulse). Recommended to be minimum: 400
* Volumes: Number of volumes to be measured
* InterPulseInterval: In what interval nordicAktiva is expecting trigger pulses from the SyncBox.
* AverageBlockLength: Average length of blocks when running with GE BrainWave, causing the sync pulse markers to only arrive when changing between on/off blocks.

Slices, TimeToRepeat, Volumes and InterPulseInterval are needed to set up the SyncBox. The setup fails if the InterPulseInterval is not a multiplier of TR.

<Settings>

<Name>Motor\_fingertapping</Name>

<Description>

*Right and left finger movement as indicated by a flashing green dot on either the left or the right side of the screen. Alternating LEFT, RIGHT, and OFF blocks, 30 seconds each; 1 OFF plus 3 cycles (C ABC ABC ABC); --- Instructions: Please instruct patients appropriately and conduct patient training to ensure patients understand their responsibilities! Patients will see a flashing green dot either on the left or on the right side of the screen. Depending on whether the dot appears on the right or left side of the screen, the patients’ job is to press the left or right thumb and index finger buttons on the ResponseGrips in synchrony with the flashing dot. The flashing dot block will last for several seconds, and will be followed by a rest period during which the patient should remain still and focus on the fixation cross. The flashing dot and rest periods will alternate several times. --- Always remember to start the paradigm before you start the MR scanner! Press NEXT to continue the study.*</Description>

<Slices>25</Slices>

<TimeToRepeat>2000</TimeToRepeat>

<InterPulseInterval>2000</InterPulseInterval>

<AverageBlockLength>20000</AverageBlockLenght>

<Volumes>120</Volumes>

</Settings>

### Variables

Variables can be defined with the Variables tag and the variables then used at any place within the paradigm description file. This can be useful if a specific value like duration of a presentation is used several times within a paradigm. To alter the value it would then be enough to change it in one place.

<Variables>

<PauseTime>100</PauseTime>

<ShowTime>400</ShowTime>

<BlockRepetitions>40</BlockRepetitions>

</Variables>

To use the variable a $ has to be put in front of the name of the variable.

<Trial>

<name>PressLeft</name>

<show>

<item>Left</item>

<duration>$ShowTime</duration>

</show>

<wait>$PauseTime</wait>

</Trial>

### Languages

Different languages can be specified within nordicAktiva. In a tag <Languages>, all the implemented languages of the paradigm are listed. The default language is defined in the Defaults.

<Languages>

<Language>English</Language>

<Language>Norsk</Language>

<Language>Deutsch</Language>

</Languages>

nordicAktiva checks if more than one language is specified and displays the choices in the GUI when loading the paradigm. To specify language dependent information all content that is language specific must be located in separate files that can then be included based on the selected language.

### Versions

Different version of the paradigm can be specified, and then selected from the nordicAktiva GUI when loading the paradigm. A tag <Versions> must list all the implemented versions of the paradigm. The default version is defined in Defaults.

<Versions>

<Version>VisualSystem</Version>

<Version>LCD</Version>

<Version>Practice</Version>

</Versions>

nordicAktiva checks if more than one version is specified and displays the choices in the GUI when loading the paradigm. To specify version dependent information all content that is version specific must be located in separate files that can then be included based on the selected version.

### Defaults

The following defaults are preset:

* BackGroundColor (Default Black)
* ForeGroundColor (Default Grey)
* DefaultPicture (Default none)
* FontSize (Default 32)
* Font (Default Arial)
* DefaultPosition (center center)
* TriggerPulse (Default sync pulse s from the SyncBox)
* Language (Default: The first one listed within Language)
* Version (Default: The first one listed within Versions)

Each of these fields can be reset in the paradigm description file. If the lines are not given, the default values are taken.

<Defaults>

<BackGroundColor>Black</BackGroundColor>

<ForeGroundColor>Grey</ForeGroundColor>

<DefaultPicture></DefaultPicture>

<DefaultPosition>MidPos</DefaultPosition>

<FontSize>32</FontSize>

<Font>Times New Roman</Font>

<DefaultKey>s</DefaultKey>

<Language>English</Language>

<Version>LCD</Version>

</Defaults>

## Definitions

The syntax allows the definition of additional colors, positions, and keys to be used in the program. The preset default values can be overwritten.

### Colors

Colors are defined in RGB. Black, white, and grey are preset as 0 0 0 for black, 255 255 255 for white and 125 125 125 for grey. The other main colors (red, green, blue, yellow) are preset as well and can be used without further definition.

To define your own color follow this example:

<Color>

<name>Green</name>

<valueR>0</valueR>

<valueG>255</valueG>

<valueB>0</valueB>

</Color>

### Position

Positions are defined with two integers representing the pixel coordinates on an 800x600 matrix. Left, right, bottom, top and center are additional values accepted describing the corresponding positions. First value: horizontal (0 = left border); predefined positions left, center and right. Second value: vertical (0 = upper border), predefined positions are top, center, and bottom.

<Position>

<name>MidPos</name>

<horizontal>center</horizontal>

<vertical>center</vertical>

</Position>

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0,0 |  |  | Center, top |  |  | 800,0 |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  | Left, center |  |  | Center, center |  |  | Right, center |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  | 0,600 |  |  | Center,bottom |  |  | 800,600 |  |

### Conditions

Conditions can be added on the Slide, Trial, or Block level in order to classify the event to the group of condition it belongs. Only events labeled with a condition are reported in the designfile. To specify the condition add the following tag to the Slide, Trial or Block you want to define as the given condition.

<condition>1</condition>

## Stimulus

The actual stimulus is organized as a hierarchy with a session consisting of blocks and trial. A block consists of one or more trials. A trial consists of slides, waits, clears and registers. The hierarchy is illustrated in Figure 1.

Figure 1 Hierarchy of stimulus

Session

Block

Trial

Slide

Trial

Slide

…

…

…

…

### Slide

Slides are the central element of the paradigm description file. They define the lowest level of a combination of sounds, pictures, text and videos. Each slide (text, picture, sound or video) used in the paradigm has to be defined.

Formats to be presented:

* Sounds: format supported depends on the DirectShow codecs installed on the system, standard supported: wav, mp3, wma.
* Pictures: bmp, jpeg, png.
* Text: Text is displayed with spaces and line-breaks as it is written in the xml file.
* Video: format supported depends on the DirectShow codecs installed on the system, standard supported: avi, wmv, mpeg.

A slide can contain several different items like sounds, text or pictures. Additionally, for each item in the slide a position can be given. The position has to be one of the predefined positions (See section 4.2.2). For text one can also specify the color, font and fontsize. The fontsize gives the height of the font in pixels. For video one can also specify the width in pixels.

The background can be specified for each slide.

All slides should be written sequentially without any other types of tags in between the slides.

<!-Slide ->

<Slide>

<name>Instruction</name>

<text>The experiment will start shortly!</text>

<position> MidDown </position>

<color> White </color>

<font>Times New Roman</font>

<fontsize>12</fontsize>

<backGroundColor> Black </backGroundColor>

</Slide>

<Slide>

<name>Moving</name>

<condition>1</condition>

<Sound>./temp/kling.wav</Sound>

<Picture>./temp/car.bmp</Picture>

<position> MidUp </position>

<duration> 2000</duration>

</Slide>

#### Expected response

For a slide one can define the expected response from the patient. To do so one defines an expectedResponse tag, with subtags named key and a tag that defines the number of expected responses. If this count is set to 0, an unlimited amount of responses are expected (like with e.g. a hand-movement paradigm), if it has a number between 1 and 99 that’s the exact amount expected for this slide, and if it is not defined, 1 response is expected. The possible response keys are A (Left thumb), B (Left index finger), C (Right index finger) and D (Right thumb).

It is not possible to define any paradigm action as a consequence of these responses, they are simply intended to monitor and calculate response accuracy and statistics.

nordicAktiva will monitor this expected response until a slide with a different expected response is shown, or until it reaches a <clear> command in the paradigm.

<Slide>

<name>LeftFingerTapping</name>

<condition>1</condition>

<Picture>left.jpeg</Picture>

<position> Center </position>

<duration> 2000</duration>

<expectedResponse>

<key>A</key>

<key>B</key>

<count>0</count>

</expectedResponse>

</Slide>

#### Using videos

One can use videos in slides. It is important to be aware that playing videos requires quite a bit of resources from your computer and can be delayed both when starting and stopping.

nordicAktiva uses Windows Direct Show for video rendering. The formats supported is therefore reliant on the installed Windows Direct Show codecs on the computer.

Video output will be rendered on top of any other visual output. You cannot show images or text on top of video output. You can specify position and with of your video output. If with is not specified for you video it will use the original resolution of it.

If your video has larger resolution than the output screen, it will be resized to fit the output screen.

<Slide>

<name>Movie</name>

<condition>1</condition>

<Video>./media/videofile.mpeg</Video>

<position> MidPos </position>

<width>640</width>

<duration> 20000</duration>

</Slide>

### Trial

Contains the basic objects SHOW, CLEAR, WAIT, REGISTER and MARKER.

The objects are executed sequentially in the order they are written in the trial.

<!-- Trials -->

<Trial>

<name>Instruction</name>

<show>

<condition>2</condition>

<item>Start</item>

<duration>1000</duration>

<abortion>true</abortion>

</show>

<register>

<key>s</key>

<number>1</number>

</register>

<clear>2000</clear>

<marker>r</marker>

</Trial>

The trial objects are the basic operators used in the syntax. They allow the combination of different slides into different trials.

#### SHOW

SHOW presents a slide. The slide to show is defined in “item”. If the duration is set to 0, the stimulus is presented until the onset of the next stimulus. The duration is given in milliseconds. If abortion is set to true, the presentation of the item is interrupted at the time a response key marker is registered; the screen is cleared and remains blank for the remaining time of the slide. If the value false is given (default), the item is presented as defined. The last command defines if overlapping presentation is possible. If overlap is set to false (default), the program waits until the presentation time has elapsed. If a true is given, the next line is processed immediately, allowing for overlapping presentation of items.

<show>

<item>check\_red</item>

<duration>125</duration>

<abortion>true</abortion>

<overlap>false</overlap>

</show>

#### WAIT

Wait for the specified duration.

<wait>1000</wait>

#### REGISTER

Wait for the specified key. If no key is defined, take the default key (usually the MR trigger pulse/key). If no number is defined, take the next trigger pulse. Counting starts at 1, so the first pulse arriving has number 1.

<register>

<key>s</key>

<number>3</number>

</register>

#### CLEAR

Clears the screen and waits for the specified duration. If no duration is given, proceed immediately.

<clear>1000</clear>

#### MARKER

If output marker is set up in nordicAktiva, this command will output the character given in this tag on that output, assuming it is set up as an ANSI connection. When nordicAktiva is set up with an ANSI output marker, it will send ANSI characters across the COM output registered in the settings. The ANSI character can be any regular character from a – z. If no marker value is specified, the marker 'm' will be used. If nordicAktiva is set up to give TTL output markers, using a <marker> tag will give a TTL output marker regardless of the character given. The output marker will be given when the presentation reaches the point where the marker is specified.

<marker>r</marker>

### Block

The Block defines a combination of Trials. This gives the option of running the same sequence several repetitive times, or running trials in random order.

The “repetitions” define how often each of the trials of the block shall be repeated. For order, a 1 represents random order within the block, for 0 the order is kept as presented in the list. Duration specifies a set duration, in milliseconds, for the block. This will cause it to last longer/shorter than the sum of its trials/slides duration.

<Block>

<name>Press</name>

<condition>2</condition>

<trials>PressLeft</trials>

<trials>PressRight</trials>

<repetitions>10</repetitions>

<order>1</order>

<duration>30000</duration>

<Block>

### Session

Combines Trials and Blocks and defines the actual order of the paradigm. It is not randomized but processed the way it is written. The name of session is optional. If not given, no name is displayed in the logfile.

<Session>

<name>RedCheckerboard</name>

<runtrial>StartTrial</runtrial>

<runblock>BlockLeft</runblock>

<runtrial>Waiting</runtrial>

<runblock>BlockRight</runblock>

<runtrial>Waiting</runtrial>

<runblock>BlockLeft</runblock>

<runtrial>Waiting</runtrial>

</Session>

## Post-processing definitions

Under the tag Process, the post-processing values for the designfile can be specified. If this section is not given, default values will be added and only basic data analysis is implemented. The nordicICE BOLD Module and nordicBrainEx take these values into account when running fMRI data analysis. The following is an example of how these setting can be specified.

<Process>

<PreProcOn> true </PreProcOn>

<GlmOn> true </GlmOn>

<SliceTime>

<SliceTimeOn> false </SliceTimeOn>

<InterleavingOn>true</InterleavingOn>

<AscendingOn>true</AscendingOn>

<OddOn>true</OddOn>

</SliceTime>

<Motion>

<MotionOn> true </MotionOn>

</Motion>

<Gaussian>

<SmoothOn> true </SmoothOn>

<GaussDim> 3D </GaussDim>

<X\_dir>5.8</X\_dir>

<Y\_dir>5.8</Y\_dir>

<Z\_dir>8</Z\_dir>

</Gaussian>

<Temporal>

<TemporalOn> true </TemporalOn>

<CutOff> 120 </CutOff>

</Temporal>

</Process>

<Contrasts>

<Contrast name=" left right"> 1 -1 </Contrast>

<Contrast name=" right left"> -1 1 </Contrast>

</Contrasts>

## Include

In order to make the paradigm description file more readable, or to separate out version and/or language specific definitions, the paradigm description can be split in segments. Within the main file, other files can be included. This makes sense if long lists of Slides, Trials, or Blocks are necessary or if different languages/versions of the paradigm are available.

<Include Language="English">./slides\_en.xml</Include>

<Include Language="Norsk">./slides\_no.xml</Include>

<Include Language="Deutsch">./slides\_de.xml</Include>

<Include Version="LCD">./slides\_HighRes.xml</Include>

<Include Version="VisualSystem">./slides\_LowRes.xml</Include>

<Include Version="Practice">./slides\_practice.xml</Include>

Any section of the paradigm description file can be included. The included file must be an XML file as well. The included file must wrap the contents to include in a root tag that will not be included. See the example include file in “7.2.3 The file slides\_vs.xml”.

Note that when nordicAktiva loads a paradigm file, it will first extract the versions and languages, as well as the default version and language from the main paradigm file, and then it will load the “include” files based on this.

# Logfiles

For each user, a directory with the logfiles is generated, with subdirectories for each patient. Within the patient directories, each logfile is labeled with the patient code, the study name and the date of acquisition (TK1T\_Motor-FingerMovement\_070611.log). Date format is yyyymmdd.

The logfiles can be saved for each experimental run with a default name. An option is given to change the name of the file is given if a file with that name already exists.

All timepoints are in milliseconds.

## Header of logfile

The logfile is formatted in a tab-delimited mode. It contains five main parts, first a technical section describing the software version, date and time. Second there’s a Patient and examination session, then there’s a settings session containing paradigm name and expected scanner settings. If you have a paradigm that contains expected responses you get a Response statistics section and last there’s the Comment.

An example of the logfile header looks like this:

Version: nordicAktiva 1.2.1

Date: 20131112

Time: 224453

Patient info:

Name: John Doe

ID: 123

Birth date: 19700101

Sex: Other

Study:

Series:

Settings:

Paradigm: Response test

Volumes: 45

Slices: 22

TR: 1000

InterPulseInterval: 1000

Response statistics

Total responses: 22

Response tasks: 20

Correct tasks: 20

Average response time: 467

Comment:

## Body of logfile

For each event occurring during the experiment one line in the body is generated. Each line consists of several tab separated columns:

* Label
  + Pulse
  + Response
  + Slide
* Code
  + Code of pulse/response
  + Name of slide
* Condition
  + The condition the current slide belongs to.
* Time
  + The time the visualization of this slide began, or the time the pulse/response was registered
* Uncertainty
  + The uncertainty of this time-point, given in milliseconds.
  + The uncertainty can be used by adding it to the “Time”.
  + For instance, in line 7 in the below example we see a pulse ‘s’ with time 2002. This meaning that we registered a sync pulse 2002 ms after the presentation started, however the uncertainty is -1, so the actual time of the syncpulse arrival is somewhere between the time 2001 and 2002.
  + A big uncertainty on a pulse indicates that the computer system was busy, and the pulse might have been registered late.
  + For slides we can, depending on hardware, drivers and nordicAktiva settings, see that we very often get a uncertainty of 1 – 17 ms. This because some setups cause the slide presentation to wait for the screen refresh, witch for most visual systems take about 16-17 ms. Thus meaning for instance that the slide “Right” with time 2000, even if ready much sooner, waited for synchronization, and was sent from the graphic driver after 2013 ms.
  + Slide uncertainty will typically vary depending on the content of the slide. The more heavy content, the larger the uncertainty.
* Duration
  + The duration a slide was displayed.
  + The duration of output TTL markers.
* ReqDur
  + The requested duration for this slide.

Example of a logfile:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Slide#** | **Label** | **Code** | **Condition** | **Time** | **Uncertainty** | **Duration** | **ReqDur** |
| 1 | Slide | Instruction | | -5602 | 15 | 5602 | Next |
| 1 | Pulse | s |  | 0 | -1 |  |  |
| 2 | Slide | Left | 1 | 13 | 17 | 1000 | 1000 |
| 2 | Response | b |  | 820 | -1 |  |  |
| 2 | Pulse | s |  | 1002 | -1 |  |  |
| 3 | Slide | Right | 1 | 2000 | 13 | 1013 | 1000 |
| 3 | Pulse | s |  | 2002 | -1 |  |  |
| 3 | Response | c |  | 2394 | -1 |  |  |
| 3 | Pulse | s |  | 3003 | -1 |  |  |
| 4 | Slide | Left | 1 | 4000 | 12 | 1013 | 1000 |
| 4 | Pulse | s |  | 4003 | -1 |  |  |
| 4 | Response | b |  | 4467 | -1 |  |  |
| 4 | Pulse | s |  | 5003 | -1 |  |  |
| 5 | Slide | Left | 1 | 6000 | 12 | 1012 | 1000 |
| 5 | Pulse | s |  | 6003 | -1 |  |  |
| 5 | Response | b |  | 6493 | -1 |  |  |

# Designfile

Further, a designfile is generated. The name is identical to the logfile, but with the ending .des. The timing information is given in seconds as floating point numbers. The file is in xml format.

The main intent for this file is for post-processing use with nordic analysis software.

## Header of designfile

The header of the designfile contains the same information as for the logfile. Additionally, information about the data acquisition and analysis is given.

<DesignFile>

<!-- Version Information -->

<VersionInfo>

<Version> nordicAktiva 1.1.0</Version>

<!-- Date format: yyyymmdd -->

<Date> 20081017 </Date>

<!-- Time format: hhmmss -->

<Time> 141551 </Time>

<!-- Design name contains the name of the paradigm. -->

<DesignName> Motor FingerMovement </DesignName>

<Comment>

</Comment>

</VersionInfo>

<!-- Patient Information -->

<PatientInfo>

<PatientName>John Doe</PatientName>

<PatientCode>123456789</PatientCode>

<PatienBirth>19010101</PatientBirth>

<PatientSex> Male </PatientSex>

<PatientSeries> </PatientSeries>

<PatientStudy> </PatientStudy>

</PatientInfo>

<!-- Settings -->

<Volumes> 100 </Volumes>

<Slices> 25 </Slices>

<!-- seconds -->

<RepetitionTime> 3.000 </RepetitionTime>

<!-- seconds -->

<InterPulseInterval> 3.000 </InterPulseInterval>

</Settings>

<Process>

<PreProcOn> true </PreProcOn>

<GlmOn> true </GlmOn>

<SliceTime>

<SliceTimeOn> true </SliceTimeOn>

<InterleavedOn>false </InterleavedOn>

<AscendingOn>true </AscendingOn>

<OddOn>false </OddOn>

</SliceTime>

<Motion>

<MotionOn> true </MotionOn>

</Motion>

<Gaussian>

<SmoothOn> true </SmoothOn>

<GaussDim> 3D </GaussDim>

<X\_dir></X\_dir>

<Y\_dir></Y\_dir>

<Z\_dir></Z\_dir>

</Gaussian>

<Temporal>

<TemporalOn> true </TemporalOn>

<CutOff>180 </CutOff>

</Temporal>

</Process>

<Contrasts>

<Contrast name=" left minus right"> 1 -1 </Contrast>

<Contrast name=" right minus left"> -1 1 </Contrast>

</Contrasts>

## Body of designfile

The following body has four columns:

* Number of Condition
* Time of occurrence (float)
* Duration of the block (float)
* Amplitude

<!—Design format: Condition OnSet Duration Height -->

<Design inSeconds = “true”>

1 0 20 1

2 30 20 1

1 60 2 1

3 90 2 1

4 96 2 1

3 102 2 1

1 110 20 1

</Design>

</DesignFile>

# Example Paradigm Description File

## The Main File

The following file is the general Paradigm Description File for a short example of a nordicAktiva paradigm. The file needs to be placed in a folder in the above specified location with the same name as the folder. This example of a Paradigm Description File has three include files which are included below.

<ParameterDescriptionFile>

<!-- Variables -->

<Variables>

<WaitTime>2500</WaitTime><!-- Use this one by setting value to $WaitTime -->

<ShowTime>125</ShowTime><!-- Use this one by setting value to $ShowTime -->

</Variables>

<!-- Languages -->

<Languages>

<!-- First one is default, if no default language is specified in "defaults" -->

<Language>Norsk</Language>

<Language>English</Language>

</Languages>

<!—Versions -->

<Versions>

<!-- First one is default, if no default version is specified in "defaults" -->

<Version>VisualSystem</Version>

<Version>LCD</Version>

</Versions>

<!-- Main Settings -->

<Settings>

<Name>Syntax test</Name>

<Description>

Here we tell the operator what to do, and what not to...

</Description>

<Slices>22</Slices>

<TimeToRepeat>2000</TimeToRepeat>

<InterPulseInterval>2000</InterPulseInterval><!-- Must be a factor of TimeToRepeat -->

<Volumes>92</Volumes>

</Settings>

<Defaults>

<BackGroundColor>Black</BackGroundColor>

<ForeGroundColor>Grey</ForeGroundColor>

<DefaultPosition>MidPos</DefaultPosition>

<!-- Include default settings specific to different versions -->

<Include Version=”LCD”>./defaults\_lcd.xml</Include>

<Include Version=”VisualSystem”>./defaults\_vs.xml</Include>

<Language>Norsk</Language><!-- Set the default language here -->

<Version>LCD</Version><!-- Set the default version here -->

</Defaults>

<!-- Positions - these positions can then be used to place text and images -->

<Position>

<name>MidPos</name>

<horizontal>center</horizontal>

<vertical>center</vertical>

</Position>

<Position>

<name>Down</name>

<horizontal>center</horizontal>

<vertical>bottom</vertical>

</Position>

<Position>

<name>Right</name>

<horizontal>right</horizontal>

<vertical>center</vertical>

</Position>

<Position>

<name>Left</name>

<horizontal>left</horizontal>

<vertical>center</vertical>

</Position>

<!-- Colors - define new or overwrite default colors -->

<Color>

<name>Green</name>

<valueR>0</valueR>

<valueG>255</valueG>

<valueB>0</valueB>

</Color>

<Color>

<name>Red</name>

<valueR>255</valueR>

<valueG>0</valueG>

<valueB>0</valueB>

</Color>

<!-- Slides -->

<!-- Define what slides to include with regards to the chosen language -->

<Include Language="English">./slides\_english.xml</Include>

<Include Language="Norsk">./slides\_norsk.xml</Include>

<!-- Include slides common to all languages, but different to different versions -->

<Include Version=”LCD”>./slides\_lcd.xml</Include>

<Include Version=”VisualSystem”>./slides\_vs.xml</Include>

<!-- Trials -->

<Trial>

<name>StartTrial</name>

<show>

<item>Instruction</item>

<duration>3000</duration>

<abortion>true</abortion>

</show>

<show>

<item>Start</item>

</show>

<register>

<key>s</key><!-- register a trigger pulse -->

<number>1</number>

</register>

<Clear></Clear><!-- clear the screen -->

</Trial>

<Trial>

<name>Waiting</name>

<register>

<key>s</key>

<number>1</number>

</register>

</Trial>

<Trial>

<name>ShowRPic</name>

<show>

<item>red\_check1</item>

<duration>$ShowTime</duration>

<abortion>true</abortion>

</show>

<show>

<item>red\_check2</item>

<duration>$ShowTime</duration>

<abortion>true</abortion>

</show>

</Trial>

<Trial>

<name>ShowGPic</name>

<show>

<item>green\_check1</item>

<duration>$ShowTime</duration>

<abortion>true</abortion>

</show>

<show>

<item>green\_check2</item>

<duration>$ShowTime</duration>

<abortion>true</abortion>

</show>

</Trial>

<Trial>

<name>PressLeft</name>

<condition>3</condition>

<show>

<item>Left</item>

</show>

<register><!-- Wait for a button response from left response grip, or trigger pulse -->

<key>AB</key>

<key>A</key>

<key>B</key>

<key>s</key>

</register>

<clear></clear>

<wait>$WaitTime</wait>

</Trial>

<Trial>

<name>PressRight</name>

<condition>4</condition>

<show>

<item>Right</item>

</show>

<register><!-- Wait for a button response from left response grip, or trigger pulse -->

<key>CD</key>

<key>C</key>

<key>D</key>

<key>s</key>

</register>

<clear></clear>

<wait>$WaitTime</wait>

</Trial>

<!-- Blocks -->

<Block>

<name>RChecker</name>

<condition>1</condition>

<trials>ShowRPic</trials>

<repetitions>20</repetitions>

<order>0</order><!-- Sequential order -->

</Block>

<Block>

<name>GChecker</name>

<condition>2</condition>

<trials>ShowGPic</trials>

<repetitions>20</repetitions>

<order>0</order><!-- Sequential order -->

</Block>

<Block>

<name>Press</name>

<trials>PressLeft</trials>

<trials>PressRight</trials>

<repetitions>10</repetitions>

<order>1</order><!-- Random order -->

</Block>

<!-- Session -->

<Session>

<name>RedCheckerboard</name>

<runtrial>StartTrial</runtrial>

<runtrial>Waiting</runtrial>

<runblock>RChecker</runblock>

<runtrial>Waiting</runtrial>

<runtrial>Waiting</runtrial>

<runblock>GChecker</runblock>

<runtrial>Waiting</runtrial>

<runtrial>Waiting</runtrial>

<runblock>Press</runblock>

<runtrial>Waiting</runtrial>

<runtrial>Waiting</runtrial>

<runblock>Press</runblock>

<runtrial>Waiting</runtrial>

</Session>

</ParameterDescriptionFile>

## Include Files

In the Paradigm Description File, additional xml files can be included. This makes the main file shorter and easier to read, and it allows us to create different versions of the same paradigm to select from when running nordicAktiva. In the following, the six files in the above given example are shown.

### The file defaults\_vs.xml

This file contains the defaults used in all language settings, when using the VisualSystem version. This uses a low resolution cross and smaller font size than the LCD version of the paradigm.

<?xml version="1.0" encoding="UTF-8"?>

<!-- Must be a top level tag to include all tags to include -->

<IncludeDefaults>

<!-- Default picture will show when there is no other visual stimuli showing -->

<DefaultPicture>./Pictures/lowRes/cross.bmp</DefaultPicture>

<FontSize>42</FontSize>

</IncludeDefaults > .

### The file defaults\_lcd.xml

This file contains the defaults used in all language settings, when using the LCD version.

<?xml version="1.0" encoding="UTF-8"?>

<!-- Must be a top level tag to include all tags to include -->

<IncludeDefaults>

<!-- Default picture will show when there is no other visual stimuli showing -->

<DefaultPicture>./Pictures/highRes/cross.bmp</DefaultPicture>

<FontSize>84</FontSize>

</IncludeDefaults >

### The file slides\_vs.xml

This file contains the slides used in all language settings, when using the VisualSystem version.

<?xml version="1.0" encoding="UTF-8"?>

<!-- Must be a top level tag to include all tags to include -->

<IncludeSlides>

<Slide>

<name>green\_check1</name>

<Picture>./Pictures/lowRes/gch1.bmp</Picture>

</Slide>

<Slide>

<name>green\_check2</name>

<Picture>./Pictures/lowRes/gch2.bmp</Picture>

</Slide>

<Slide>

<name>red\_check1</name>

<Picture>./Pictures/lowRes/rch1.bmp</Picture>

<position>MidPos</position>

</Slide>

<Slide>

<name>red\_check2</name>

<Picture>./Pictures/lowRes/rch2.bmp</Picture>

<position>MidPos</position>

</Slide>

</IncludeSlides>

### The file slides\_lcd.xml

This file contains the slides used in all language settings, when using the LCD version. Note that the difference between this and the VisualSystem slides are only what images they use in the slides. For the LCD we need higher resolution images.

<?xml version="1.0" encoding="UTF-8"?>

<!-- Must be a top level tag to include all tags to include -->

<IncludeSlides>

<Slide>

<name>green\_check1</name>

<Picture>./Pictures/highRes/gch1.bmp</Picture>

</Slide>

<Slide>

<name>green\_check2</name>

<Picture>./Pictures/highRes /gch2.bmp</Picture>

</Slide>

<Slide>

<name>red\_check1</name>

<Picture>./Pictures/highRes /rch1.bmp</Picture>

<position>MidPos</position>

</Slide>

<Slide>

<name>red\_check2</name>

<Picture>./Pictures/highRes /rch2.bmp</Picture>

<position>MidPos</position>

</Slide>

</IncludeSlides>

### The file slides\_english.xml

This file contains the language specific slides for the English language version of the paradigm.

<?xml version="1.0" encoding="UTF-8"?>

<IncludeSlides><!-- Must be a top level tag to include all tags to include -->

<Slide>

<name>Start</name>

<text>

The experiment will start shortly!

</text>

</Slide>

<Slide>

<name>Instruction</name>

<!-- English text -->

<text>

Do whatever you want to...

but do not move!

</text>

</Slide>

<Slide>

<name>bg\_music</name>

<!-- Add a sound file -->

<Sound>./audio/ding.wav</Sound>

<duration>3000</duration>

</Slide>

<Slide>

<name>Left</name>

<!-- English text -->

<text>

Press left button!

</text>

<Position>Left</Position>

<Sound>./audio/ding.wav</Sound>

<!-- Expect right hand responses -->

<expectedResponse>

<key>A</key>

<key>B</key>

<count>0</count><!-- Expect an unlimited amount of responses -->

</expectedResponse>

</Slide>

<Slide>

<name>Right</name>

<!-- English text -->

<text>

Press right button!

</text>

<Position>Right</Position>

<!-- Add a sound file -->

<Sound>./audio/ding.wav</Sound>

<!-- Expect right hand responses -->

<expectedResponse>

<key>C</key>

<key>D</key>

<count>0</count><!-- Expect an unlimited amount of responses -->

</expectedResponse>

</Slide>

</IncludeSlides>

### The file slides\_norsk.xml

This file contains the language specific slides for the Norwegian language version of the paradigm.

<?xml version="1.0" encoding="UTF-8"?>

<!-- Must be a top level tag to include all tags to include -->

<IncludeSlides>

<Slide>

<name>Start</name>

<text>

Eksperiementet starter snart!

</text>

</Slide>

<Slide>

<name>Instruction</name>

<!-- norwegian text -->

<text>

Gjer kva du vil,

berre du ligg roleg!

</text>

</Slide>

<Slide>

<name>bg\_music</name>

<Sound>./audio/ding.wav</Sound>

<duration>3000</duration>

</Slide>

<Slide>

<name>Left</name>

<!-- norwegian text -->

<text>

Trykk venstre knapp!

</text>

<Position>Left</Position>

<Sound>./audio/ding.wav</Sound>

<!-- Expect right hand responses -->

<expectedResponse>

<key>A</key>

<key>B</key>

<count>0</count><!-- Expect an unlimited amount of responses -->

</expectedResponse>

</Slide>

<Slide>

<name>Right</name>

<!-- norwegian text -->

<text>

Trykk høyre knapp!

</text>

<Position>Right</Position>

<Sound>./audio/ding.wav</Sound>

<!-- Expect right hand responses -->

<expectedResponse>

<key>C</key>

<key>D</key>

<count>0</count><!-- Expect an unlimited amount of responses -->

</expectedResponse>

</Slide>

</IncludeSlides>