FreeWRL library interface

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1 FreeWRL library specification

1.1 Current situation

1.1.1 Excerpt from libFreeWRL.h

I stripped comments and platform specific code from libFreeWRL.h:

```c
const char *libFreeWRL_get_version();
typedef struct freewrl_params {
  ...
} freewrl_params_t;
extern freewrl_params_t fw_params;
bool initFreeWRL(freewrl_params_t *params);
void startFreeWRL(const char *url);
void closeFreeWRL();
void terminateFreeWRL();
int ConsoleMessage(const char *fmt, ...);
```
I gathered the functions really used in the front-end code:

```
$ nm .libs/freewrl | sed -n '/ U /p' | sed -e 's/[ 	]U //p' | grep -v GLIBC
ConsoleMessage
doQuit
initFreeWRL
initStereoDefaults
libFreeWRL_get_version
setAnaglyphParameter
setEaiVerbose
setEyeDist
setLineWidth
setScreenDist
```

### 1.1.2 What's used in the Linux front-end

I gathered the functions really used in the front-end code:
Doing the same for data structures and global variables:

```
$ nm .libs/freewrl | sed -n '/ B /p' | sed -e 's/.*[ \t]*B //' | grep -v GLIBC
_fw_browser_plugin
_fw_instance
_fw_pipe
isBrowserPlugin
keypress_string
params
```

Looking (quickly) into the code, I’ve found:

```
in src/bin/main.c

  freewrl_params_t *params = NULL;
```

### 1.2 What to do to improve the situation

#### 1.2.1 Naming convention

We have to decide about an enforced naming convention.

Not to say that

```
gnu_or_open_source_convention
```

is better than

```
MicrosoftOrSoCalledPolishNotation
```

That’s not my intent.

But to make all the FreeWRL code homogeneous.

Personnaly I feel the first more readable. But feel free to comment / propose.

#### 1.2.2 Namespace

All symbols that are visible outside must be declare in `libFreeWRL.h`.

All platform specific cases should be handle through glue code.

- Data types
  All data types that can be used from outside (thus declared in `libFreeWRL.h`) must be consistently named:
typedef struct { .... } fwl_params_t;
extern int fwl_is_browser_plugin;
extern char *fwl_keypress_string;

instead of:

typedef struct freewrl params { .... } freewrl_params_t;
extern int isBrowserPlugin;
extern char *keypress_string;

• Functions
All libFreeWRL functions that can be called from outside (thus declared in libFreeWRL.h) must be consistently named:

    void fwl_init();
    void fwl_quit();

instead of:

    bool initFreeWRL(freewrl_params_t *params);
    void doQuit();

• MACROs
All macros that can be used from outside (thus declared in libFreeWRL.h) must be consistently named:

    #define FWL_VIEWER_WALK 2
    #define FWL_IS_BROWSER_PLUGIN (fwl_is_browser_plugin)

instead of:

    #define VIEWER_WALK 2
    #define RUNNINGASPLUGIN (isBrowserPlugin)

1.2.3 Graphic system initialization

• Current situation
Correct me if I’m wrong.

On Linux the front-end calls the library which initialize itself the X11 display and the GLX context. Thus the front-end does not have the control here.

On Mac the front-end initialize the Aqua display and the AGL context.

On Windows the situation is somewhat similar to Linux (see fwWindow32.c).

Let’s call the graphical system initialization and variables the context.

• A more flexible method
A method to make all platforms use the same codebase for the context.

Beside the fwl_params_t structure that has to be extensively used we ought to create another data type for context initialization. Let’s call it fwl_context_t for the sake of simplicity.

This data type shall be anonymous, that is generic. Then, each platform will have a specific implementation of this type. I.e. a fwl_context_x11_t, fwl_context_aqua_t, fwl_context_win_t, . . .

This type will have two use cases.
The first is when the front-end initializes itself the context. I.e. when it initializes the context in a way that fits its specific needs. The front-end do that, then fills in the FreeWRL context with actual values for the library to access them when this is needed.

The second use case is when the front-end delegate the graphical context initialization to the library. Through this data structure, the front-end can access the context variables if it needs.

- Example
  Linux GLX context and X11 window identifier in the specific fwl_context_x11_t:

  ```c
  typedef struct {
    ...
    GLXContext ctx;
    Window win;
    ...
  } fwl_context_x11_t;
  
  Windows WGL context and Win32 window identifier in the specific fwl_context_win_t:

  ```c
  typedef struct {
    ...
    HGLRC ctx;
    HWND win;
    ...
  } fwl_context_x11_t;
  ```

1.2.4 Events

- Current situation
  All events, coming through a specific graphical system, must be translated into a common, generic event. Because the current situation is a mess. Each platform has its specificities about event. This prevent us to improve the user experience. This will be a concern for iPhone and Android...
  Example of the current situation with the event generated when the window geometry changes. You can see a lot of differences...

  **Linux**

  ```c
  switch(event.type) {
    case ConfigureNotify:
      setScreenDim (event.xconfigure.width,event.xconfigure.height);
      break;
  }
  ```

  **Windows**

  ```c
  switch( msg ) {
    case WM_SIZE:
      GetClientRect(hWnd, &rect);
      screenWidth = rect.right; /*used in mainloop render_pre setup_projection*/
      screenHeight = rect.bottom;
      resize_GL(rect.right, rect.bottom);
      setScreenDim(rect.right,rect.bottom);
      break;
  }
  ```
Mac
Where is this? In the front-end obviously. Then the front-end pass events to the library through the function handle_aqua().

• How to improve
Create a unique definition for events of all sorts. Let’s call it fwl_event_t for the sake of simplicity.
Create a function to translate an <whatever platform> event into a fwl_event_t.
Create a function to eat an event. I.e. to act on the event.
Create a system of callbacks.

Then, two cases are possible:

– the library runs the event loop (it has created the context). Default callbacks are programmed to be called for each interesting events. The list of default callbacks defines a viewer behavior or an actor. I.e. walk and fly are two different actors.
– the front-end is the master (it initialized the context and controls the event loop). It programs callbacks for all the events it wants to eat itself. Then pass the event to the library. Which translates the event, and then to act upon it. The callbacks are called by the library actor active at this time.

1.2.5 OpenGL binding

A great job was accomplished when a lot of OpenGL calls where replaced by macros. That way a compile time selection of the rendering capabilities is possible. If this is possible, the job has to be finished: i.e. for all OpenGL calls.

Basically we can see OpenGL-ES as a subset of OpenGL. But for FreeWRL to work correctly OpenGL-ES requires the use of VBO.

1.2.6 An unique function to get/set libFreeWRL variables

• Purpose

– all variables visible from outside the library that need an accessor (to trap changes, update other variables, . . . )
– all variables exposed to scripting language or external processes (SAI/EAI) that need an accessor (check type, check value, . . . )

• Variable list

– window (type is platform specific)
– OpenGL window (type is platform specific)
– GLX/AGL/WGL context (type is platform specific)
– width
– height
– fullscreen (switch)
– eai (switch)
– verbose (switch)
– collision (switch)
– starting url (world base)
- viewer mode
- snap (switch)
- snap directory
- snap file pattern
- EAI verbose (switch)
- screen dist
- stereo (switch)
- shutter glass (switch)
- eye dist
- anaglyph
- side by side (switch)
- stereo buffer mode (switch)
- line width
- snap gif (not used?)
- print shot (can’t understand this?)
- browser full path (need rework)
- pipe and all plugin related variables (I rewriting this)
- keypress_string (need rework)
- ask for refresh, refresh switch or status (need rework)

• Implementation

- a new include file could be created with the list of variables (it will be included in libFreeWRL.h when this step is finished)
- a new source file could be created with the unique accessor function