Mobile OpenGL game porting to Tizen: hands-on experience

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World Cup Table Tennis

- Arcade game
- 2-player game modes
Android application structure

Android (Java)
- User Interface
- OpenGL context
- Sound Player
- Animated text

Android NDK (C++)

```c
render()
{
    EnterFrame();
    ExitFrame();
    RenderScene();
}
```
Building Game Core for Tizen

Game Core (NDK, C++)

Android (Java)
Building Game Core for Tizen

- Tizen
- Game Core (NDK, C++)
- Android (Java)
- Build
Tizen OpenGL application

Frame-based
- Frame

Form-based
- Form 1: Splash Screen
- Form 2: UI menus
- Form 3: OpenGL context Overlaying controls

Overlaying Tizen controls
OpenGL texture loading (Android)

### Android (Java)

```java
for(int id = 0; id < num_of_textures; id++)
{
    initTexture(id);
}

initWithImage(id)
{
    Bitmap *bmp = GetBitmapN(id);
    handleBitmap(bmp);
    glTexImage2D(..., bmp);
    delete bmp;
}
```

### Android NDK (C++)

```c++
initTexture(id);
{
    glGenTextures(1, name);
    glBindTexture(..., *name);
    initWithImage(id);
}
```
Tizen application structure

Main Thread

WcttTzApp

GameThread

MainActivity

Sound Thread

Sound Player

MsgSender

Main Menu
Scores
Options
Team Selection
Paddle Selection

Renderer
IGIRenderer
OpenGL form
Form

Form

Event

EventDrivenThread
Tizen application structure: GameThread class

Main Thread

GameThread
- Renderer: IGLIRenderer
- OpenGL form: Form

WcttTzApp

MainActivity
- Main Menu
- Scores
- Options
- Team Selection
- Paddle Selection

MsgSender
- : Event

Sound Thread

Sound Player
- : EventDrivenThread
Separate game thread (workaround for an early F/W ver.)

- Allowed FPS rate increase
- Caused synchronization problem

```cpp
while();
{
    render();
    glFlush();
}
```

~70 Hz

```cpp
while();
{
    _openGlForm->Invalidate();
}
```

~20 Hz
Tizen application structure

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: IGIRenderer

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MainActivity

: Form

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: Event

Sound Thread

Sound Player

: EventDrivenThread
Tizen application structure: MainActivity class

- **Main Thread**
  - WcttTzApp
  - GameThread
    - Renderer: IGIRenderer
    - OpenGL form: Form
  - MsgSender: Event

- **MainActivity**
  - : Form
    - Main Menu
    - Scores
    - Options
    - Team Selection
    - Paddle Selection

- **Sound Thread**
  - Sound Player: EventDrivenThread
Issue of a blank WebView

AddControl(web_view)

In 1-2 seconds...
Tizen application structure: SoundPlayer class

Main Thread

- WcttTzApp
- GameThread
  - Renderer: IGIRenderer
  - OpenGL form: Form
- MainActivity
  - Main Menu
  - Scores
  - Options
  - Team Selection
  - Paddle Selection
- MsgSender
  - Event

Sound Thread

- SoundPlayer
  - : EventDrivenThread
Sound Player use options

- Playing mp3 and other compressed formats
- Playing a number of sounds simultaneously

Tizen::Media::Player player;

// Maximal delay
player.OpenFile(path);
player.Play();

// Lower delay
player.OpenBuffer(buffer);
player.Play();

Tizen::Media::Player player[64];
for(int i = 0; i < 63; i++)
{
    player[i].OpenBuffer(buffer[i]);
}

// Minimal delay.
// Playing simultaneously
player[2].Play();
player[0].Play();
player[1].Play();
player[3].Play();
Playing sound

- If one needs to play a sound “sound_id”

  ● Low number of players
  1 If player is free:
     player.OpenBuffer(buffer[sound_id]);
     player.Play();
     Exit.
  2 Otherwise, choose another player.
     Go to step 1.

  ● High number of players
  1 Open buffers in advance:
     player[0].OpenBuffer(buffer[sound_0]);
     ...
     player[N].OpenBuffer(buffer[sound_N]);
  2 Play sound in prepared player:
     player[sound_id].Play();
Tizen application structure: MsgSender class

Main Thread

WcttTzApp

GameThread

Renderer : IGIRenderer
OpenGL form : Form

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SoundPlayer : EventDrivenThread
Summary

- Relatively simple porting of C++ OpenGL code to Tizen
- Rich Tizen::Ui namespace for implementation of complex animated user interfaces
- Developer friendly Tizen::Media::Player class for mixed sounds playing
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