University Politehnica Timișoara, Romania
Department of Automation and Applied Informatics

VR medical gamification for training and education

Stelian NICOLA
Ioan VIRAG
Lăcrămioara STOICU-TIVADAR

Email: stelian.nicola@aut.upt.ro

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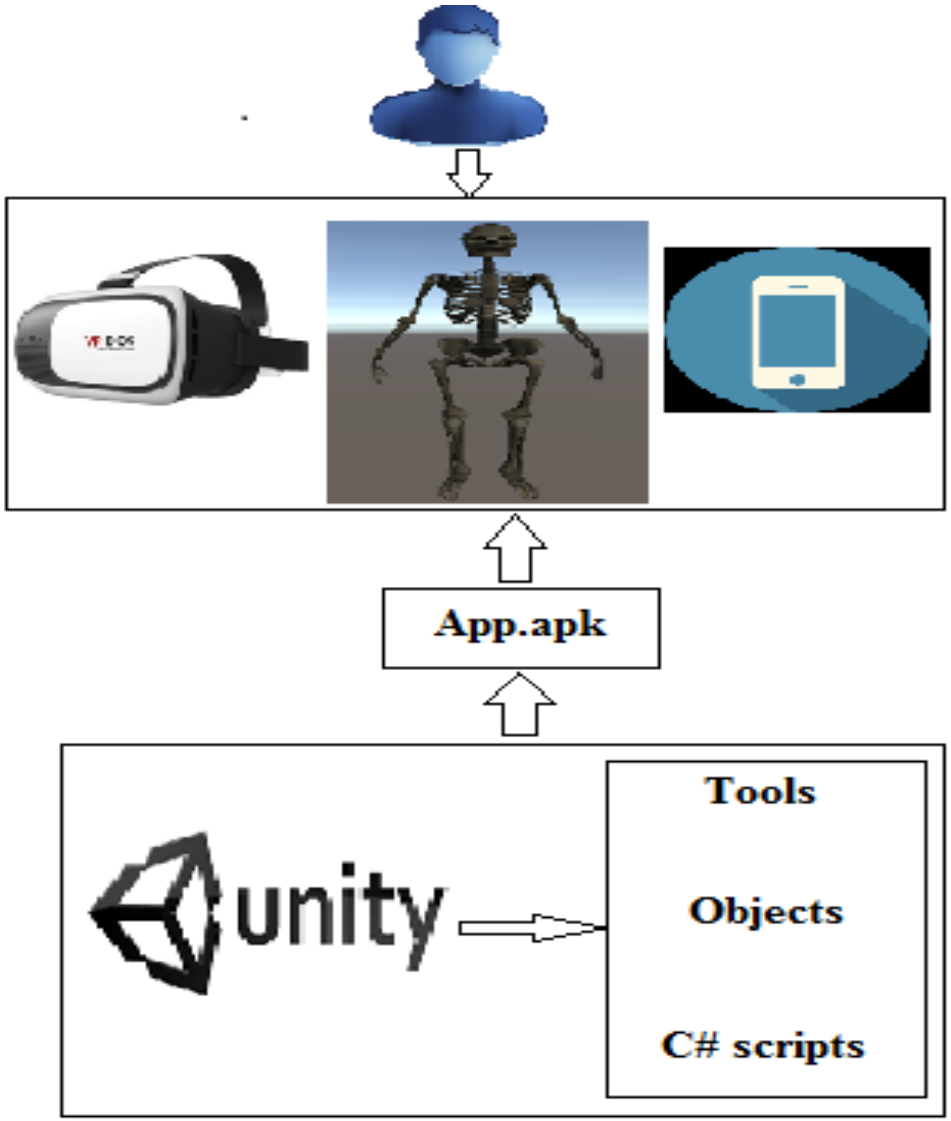
VR, AR and Gamification

State of the art

- Virtual reality Therapy for Adults Post-Stroke
- Virtual reality as an adjunctive pain control in burns caring for adolescent patients
- VR technology may serve as an effective non-pharmacological analgesic to aid pain management.
- Leap Motion supporting medical education – Skedu

System architecture



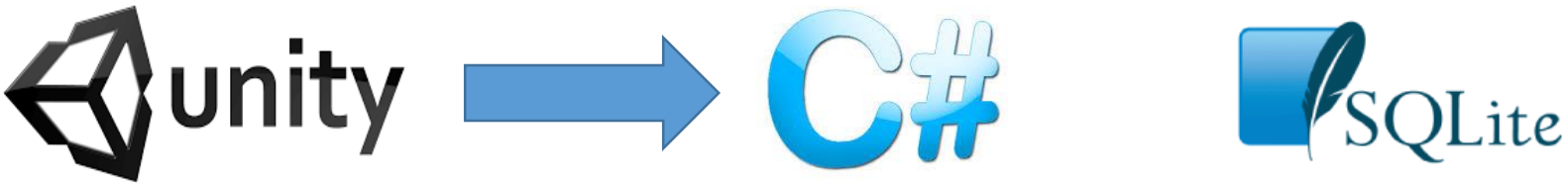
SkeduVR

- complex mobile application supporting medical students to manipulate and learn the bones of a virtual human skeleton displayed in a virtual 3D scene

- development process
- results

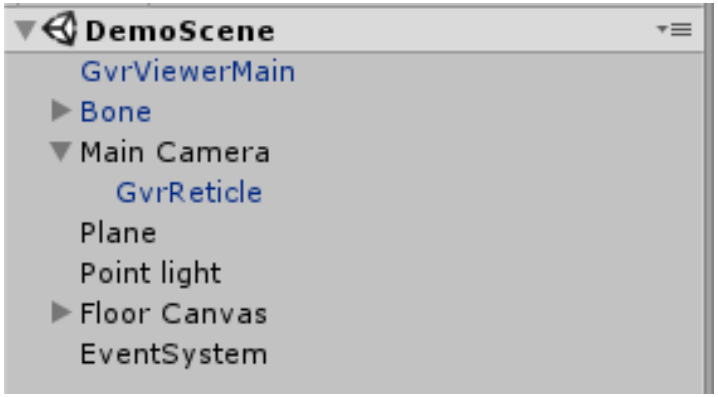
Tools

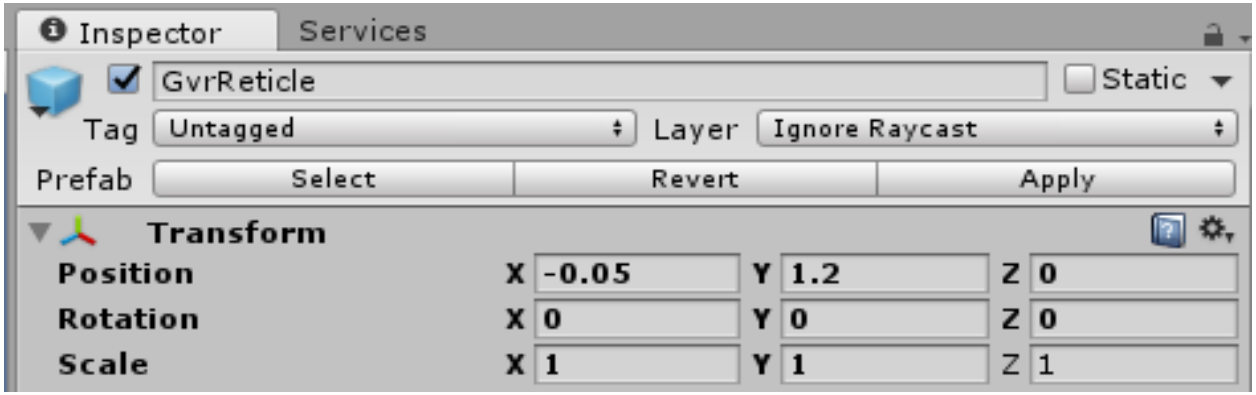
- Unity 5.4 and C# scripts
- Google VR SDK
- SQLite



Objects

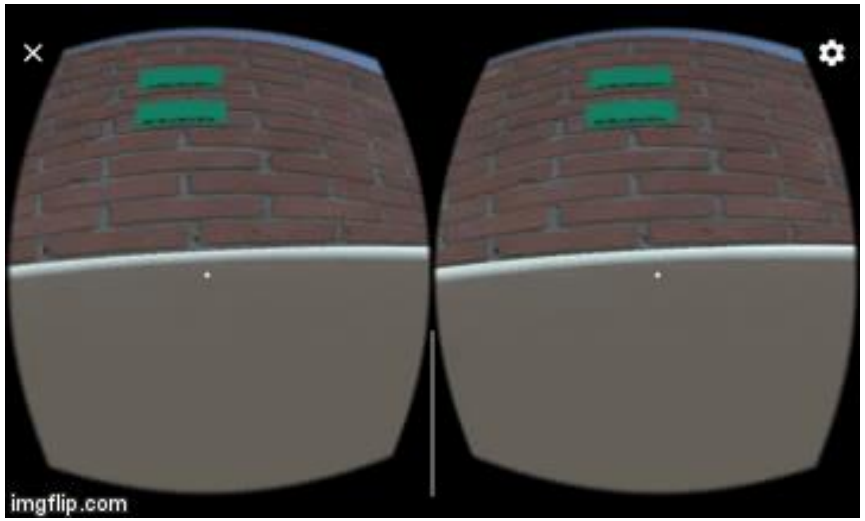
- Gvr Reticle
- Gvr MainCamera
- Bone
- Plane
- Point light, Text and Menu (3 buttons)

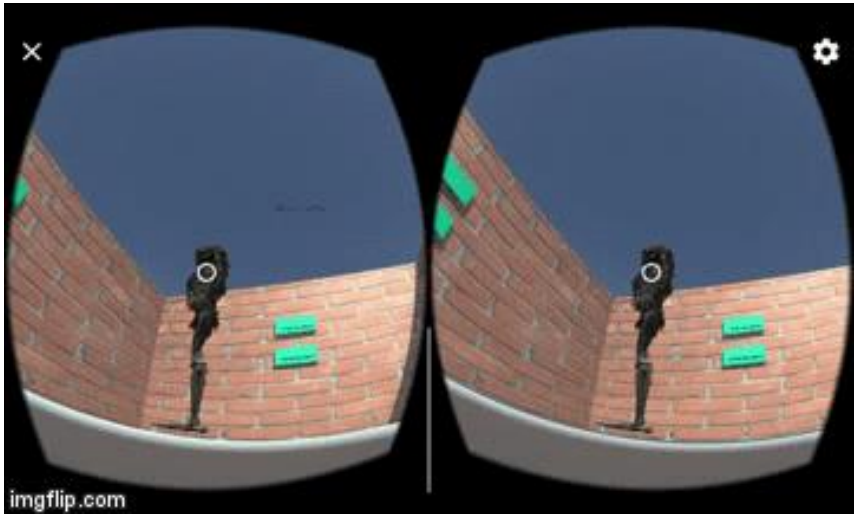




Main functionalities

- Turning On and Off the spin of the skeleton
- Selected bone information
- Movement in 3D space.
- Reset current position in the virtual 3D space





Methods

- *Spinning equation (rotating the object):*

$$R = m_i + k;$$

where:

m_i - represents the measure of the angle of rotation at moment i (i = 1-> n; n = 8);

k - constant angle of 45 °;

R - measure of the angle of rotation.

Table 1. Measure of the angle of rotation R for one rotation:

i	m_i	k	m_i+k	R	Rotation number i/n
1	0°	45°	0°+45°	45°	1/8
2	45°	45°	45°+45°	90°	2/8
3	90°	45°	90°+45°	135°	3/8
4	135°	45°	135°+45°	180°	4/8
5	180°	45°	180°+45°	225°	5/8
6	225°	45°	225°+45°	270°	6/8
7	270°	45°	270°+45°	315°	7/8
8	315°	45°	315°+45°	360°	8/8

Methods

- Spinning off equation *(not rotating the object)* :

$$\mathbf{R=m_f +k;}$$

where:

m_f - is the measure of the angle of rotation in the final moment f (f = 1-> n; n = 8);

k - constant angle of 0 °;

R - measure of the angle of rotation (angle equal measure when finally m_f).

- Movement equation:

$$P_{fc} (x_f, y_f, z_f) = P_{ic}(x_i, y_i, z_i) * s; \quad (x_f > x_i, y_f = y_i, z_f > z_i)$$

where:

$P_{fc} (x_f, y_f, z_f)$ - the final position of the camera on coordinates x, y, z;

$P_{ic}(x_i, y_i, z_i)$ - the initial position of the camera on coordinates x, y, z;

s - constant vector speed

Discussions and conclusions

- **Android 4.2** << Android 5.1 << Android 6.1

- The distance between headset and the mobile phone and the distance between the two lenses -> mechanically buttons

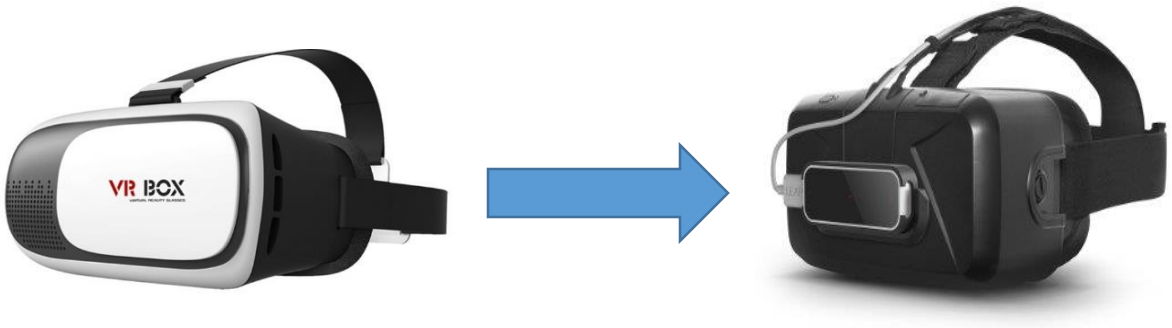
- Installing the application on mobile phones is easy, being the same as for any other regular applications

Discussions and conclusions

- Gamification, the concept that the application is based on, offers to users the possibility to learn and control the bones of the human skeleton in a realistic mode.

- The application enables the users to learn the bones of the human skeleton in an interactive way and a realistic 3D environment.

- App.apk 1.1 (VR) **->** App.apk 2.1 (AR)



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