Soundpainting recognition  
LOG file

# 20/01/2020

Start of the log file.

History of the project:

* Motivation: create a recognition & synthesis tool for SP, usable by the soundpaiting community and artists. It should be rather cheap and open-source.
* First approach: GeKiPe tool augmentation proposal
* Problems: does not fit technical requirements & collaboration process for 17 weeks
* GeKiPe proposal abandoned after skype meeting with its team

Started reviewing the possible technical tools for both full body and hands tracking.

* Leap motion: not convenient because of occlusion and limited tracking space
* Passer VR: aggregator for multiple tracking devices, but does not support (yet) the gloves or the suit
* Leap motion + Manus VR gloves: a semester project has been offered on this topic in 2018. I have reached the two EPFL collaborators to know more about this.
* Xsense suite : expensive and intrusive, but provide better results than kinect. May not connect with OSC directly, but fully compatible with Unity and VR products.
* Hi5glove from Noitom: alternative to the Manus gloves
* Kinect + gloves: needs aggregator such as Passer VR or GeKiPe code. Seems like the best option so far in terms of cost and efficiency.

Conclusion:

There are two options:  
The best one to my knowledge is the kinect or standard camera + gloves. It is not very intrusive and can be reused for future projects.  
The second one is the full suit, which seems expensive and also intrusive, even though it can be covered.

Then about the output of the tracking system, the Unity-based option is a common one. Everything on the market seems to connect to Unity. I wonder whether this would not increase latency for me, but starting with Unity is also a good way for making the project very modular and keep the option of future development open. The alternative is the OSC as used in GeKiPe. I need to get in touch with GeKiPe dev in order to check if at least the gloves-OSC pipeline is directly reusable or not.

I have no idea on how to connect Unity to a ML system.

21/01/2020

I took a greater look at RunwayML yesterday. I have no computer with Nvidia cards and a linux distribution to make it work yet. That can be an issue.

The good thing about WeKinator is that it takes as input any OSC signal. Basically, that would allow me to completely bypass Unity if I use the same system as GeKiPe.

I will have to take a greater look at OSC itself.

OSC seems to also connect to Unity3D (how?).

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The **Mimu gloves** are directly outputting as OSC and MIDI and connect very easily to DAW softwares. It looks like the best solution so far, and probably far less expensive than other gloves. It uses (I think, at least in the early versions <https://www.youtube.com/watch?v=aR1YnIj-DyM&list=FLZdLJBtwk1MK7lxG_xRHI2Q&index=39>) the x-OSC board to transmit signals of the bending sensors to computer via OSC. They relate in a past article from a 2014 prototype that they also use kinect for body tracking. I have sent them a message about this.  
Important links related to MiMu project:  
<https://web.archive.org/web/20160115203711/http://dev-blog.mimugloves.com/>  
https://web.archive.org/web/20160130062339/http://dev-blog.mimugloves.com/data-gloves-overview

The core members of the mimu glove actually left traces of prior experiment on the internet, it’s nice to watch and see those. <https://www.instructables.com/member/Plusea/instructables/>  
<https://www.youtube.com/channel/UCzlt8PEErHGi-OokYIX_UKA>  
https://www.youtube.com/watch?v=3ygKcBOFLJU

Perception neuron and SmartSuit pro are two other alternatives for the suit.

Other possibilities:

* <https://infusionsystems.com/catalog/advanced_search_result.php?search_in_description=0&inc_subcat=0&keywords=TouchGloves&x=8&y=17&categories_id=>
* <https://www.virtualmotionlabs.com>
* <https://stretchsense.com/shop/>
* <http://www.keyglove.net/>
* <https://www.virtualmotionlabs.com/vr-gloves/vr-glove/>, 900$ for a pair with edu discount

# 22/01/2020

Intel Realsense Depth Camera D435 out of the game after performance review <http://docs.ipisoft.com/Depth_Sensors_Comparison>, but they connect to OSC https://github.com/mpinner/RealsenseOscMulticast.

**Azure Kinect** (latest version) has a very wide field of view, very good to know, and sounds like performances are nice also. They also support finger joints tracking since recently (<https://feedback.azure.com/forums/920053-azure-kinect-dk/suggestions/38154784-hands-support-in-body-tracking>).

It looks like **next project ot Rebecca Fiebrink (creator of WeKinator) is the** [**http://interactml.com/**](http://interactml.com/) ML soft for Unity. In a way ,it should allow for direct implementation of the ML pipeline in Unity. <https://github.com/Interactml/iml-unity>

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**InteractML is a game changer**, because things then are really not required to be pipelined through OSC then. That it, any glove can make it, as long as it has a Unity SDK (most of the times it is so). **It is yet in development** (they say 70%) but I have read that a standard classifier is already there.

**Rapid-MIX** sounds like a nice alternative to WeKinator. <https://www.doc.gold.ac.uk/eavi/rapidmixapi.com/index.php/getting-started/>  
It binds with Unity <http://gitlab.doc.gold.ac.uk/mgill009/rapidlib-unity>  
It can loads models from WeKinator here: <https://github.com/mzed/wekimini>

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I have called José Miguel, the software engineer at IRCAM who worked with GeKiPe. He has convinced me to take a better look at Max/MSP and alors suggested me to see the features of the MuBu plugin for Max/MSP developped by IRCAM.

He also shared with me the contact of Alexander [alexander.vert.flashback@gmail.com](mailto:alexander.vert.flashback@gmail.com) who knows how to get gloves with flexsensors for around 200€ (5 times cheaper than the MiMu) that also connect with OSC. He will also ask the guy who built the RioT card at IRCAM how easy it is to integrate flexsensors. Making it cheap is really the goal here, since it would drop the price below 200€ per glove as well.

**Little conclusion for the day:**

MiMu gloves or vr gloves from virtualmotionlabs are great, but somehow expensive. I definitely want to reuse the gloves for later and have things as open sourced as possible. I think that Unity can be the engine for the recognition module since it connects with quite everything (Max/MSP, OSC, proprietary gear..) and allows for later development of a visual interface, which, let’s say, can be amazing for the future.

In the next days, I will take a look at Max/MSP and the InteractML examples.

# 23/01/2020

I have checked out two knew possibilities.

First, Google released recently the Mediapipe that allows for a very efficient hand tracking and gesture classification, probably very useful in my use case.  
<https://ai.googleblog.com/2019/08/on-device-real-time-hand-tracking-with.html>

Then, I have also reach the spanish company Showleap that is developing… a spanish sign language translator. They seem to rely on two different techniques: video hand tracking and muscular electronic signals sensing.

# 27/01/2020

So Emmanuel from IRCAM pointed me to a possible use of bend sensors on I2C protocol to use with the cheap RioT card from IRCAM. This sensor seems to do the job perfectly: <https://www.sparkfun.com/products/14666>

I am starting to think that building the glove should not be such a pain, and if it can make it the cheapest solution, I would like to try it.

# 28/01/2020

<https://github.com/dariopavllo/robust-finger-tracking>

# 31/01/2020

These last days, I have reached several people that may become important for the project.

On the topic of grammar implementation the most optional topic, Jean Cédric Chappelier told me we can have a discussion; he has worked on these problems before.

Boulic Ronan who leads the IIG. I had missed during all my tech review that we have the competencies at EPFL for that subject, and his group can probably be the right place for me to implement my project. He will discuss with his team about this February the 4th.

Good news are that the EM+ lab will cover the expenses for the gloves and licenses, I think Sarah is of a great support here, even though Lorenzo is clearly pointing out that the EM+ lab will not and can not support me on the technical aspects.

I did not really understand Ronan’s answer about the camera-based handtracking solutions but I guess I was confused about the technique they speak about in their article "Real-time neural network prediction for handling two-hands mutual occlusions" (the active markers) and probably, he did not work on a camera-only based tracking system. Anyway, this could be clarified later.

He points out that I really should already know the hardware I will use and how it works. I think it is a very good idea to decide right after Ronan’s meeting the exact hardware I will use, so that I can test it during the soundpainting workshop.

# 02/02/2020

Finished to write the V2 of my proposal, sent to all the interested people. Things will have to move on quickly now...

Found out about the VRfree gloves, made in CH by ETH alumnis <https://www.sensoryx.com/>.  
Cheapest (like a LOT cheaper), but convenient solution. I have reached them by email, hoping at getting an answer soon.

# 07/02/2020

Ronan has accepted to co-supervise my project.

The Sensoryx team has answered my emails; their glove is the best quality/price ratio but they don’t have any in stock and no possibility to buy one before end of march, so I think I should drop the option to start the project.

They helped me lot by pointing me to <https://www.marui-plugin.com/mivry/>. I will reach them ASAP.