

# Running SWHAP: the CMM and TAUMus case studies

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# TAUmus : why is it so interesting?

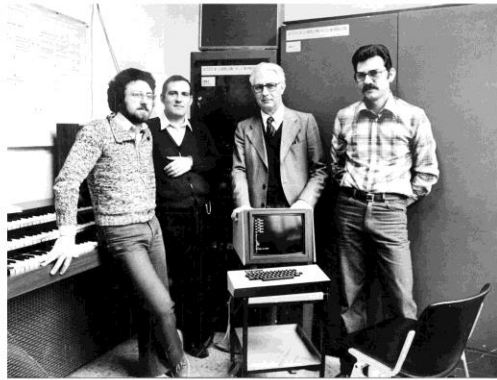
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- Dedicated (and still existing) hardware

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# TAUmus : why is it so interesting?

- Developed in Pisa: fits well the SWHAP@Pisa project
- Dedicated (and still existing) hardware
- A pioneeristic work
- Tons of related material (thanks to Leonello Tarabella)



# Home art nowadays



# An overview of Grossi's work

- Born in 1917 in Venice
- 1965: professor for the first electronic music course in Italy
- 1967: starts exploring computer music (first Olivetti, then CNUCE)
- 1970: first experiment on musical telematics
- 1975: deployment of TAU<sub>2</sub>/TAU<sub>mus</sub> system
- 1985: introduces the concept of Home Art



# An overview of Grossi's work

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- 1985: introduces the concept of Home Art
- More info: <https://www.pietrogrossi.org>

# The heritage of CMM

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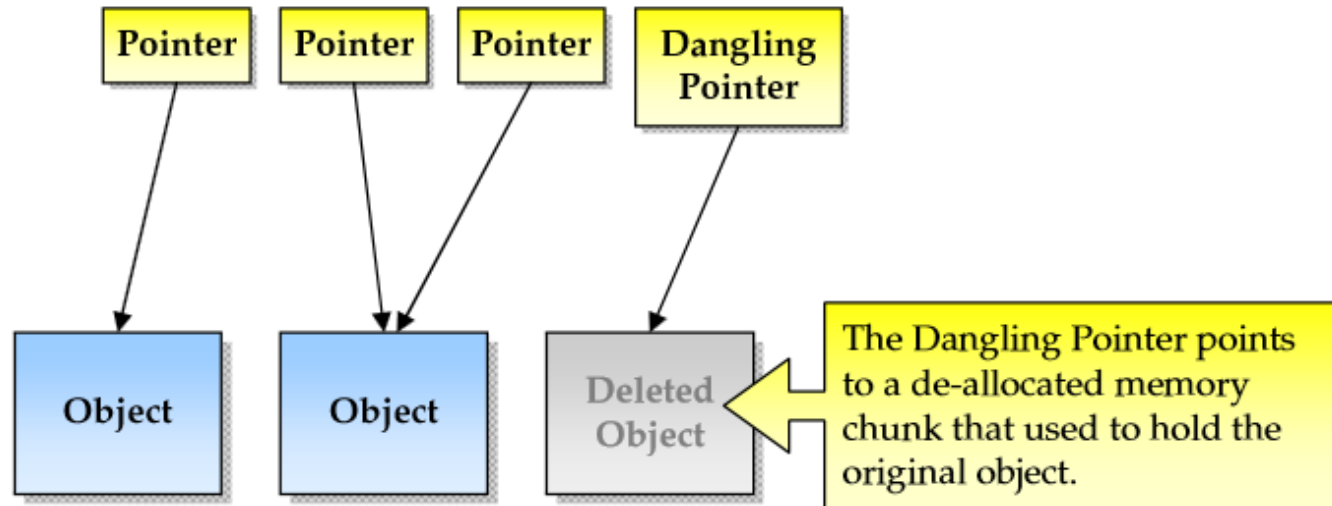
- CMM: Customisable Memory Manager, what for?

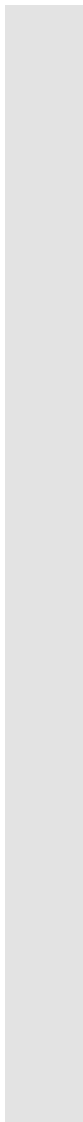
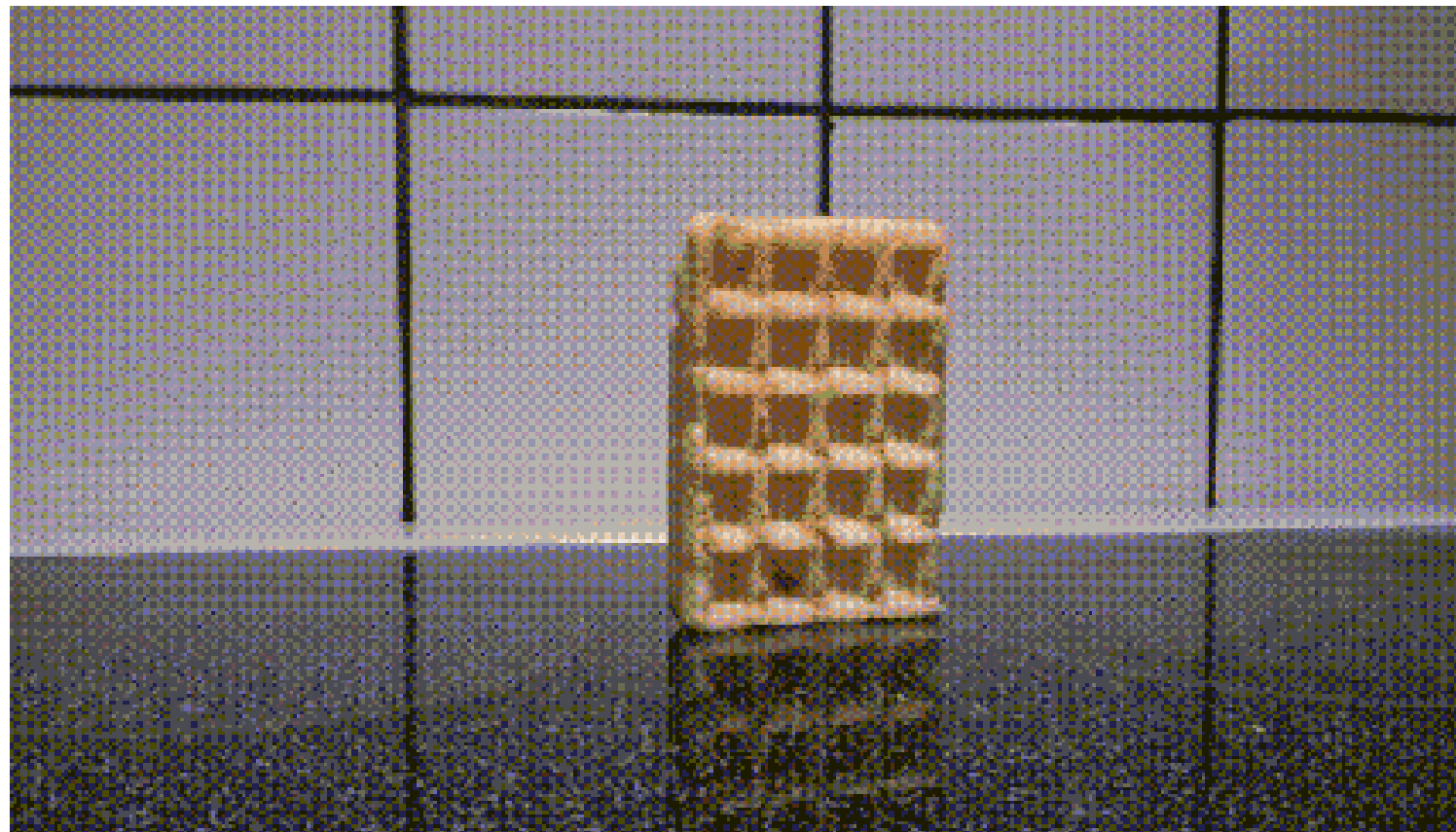
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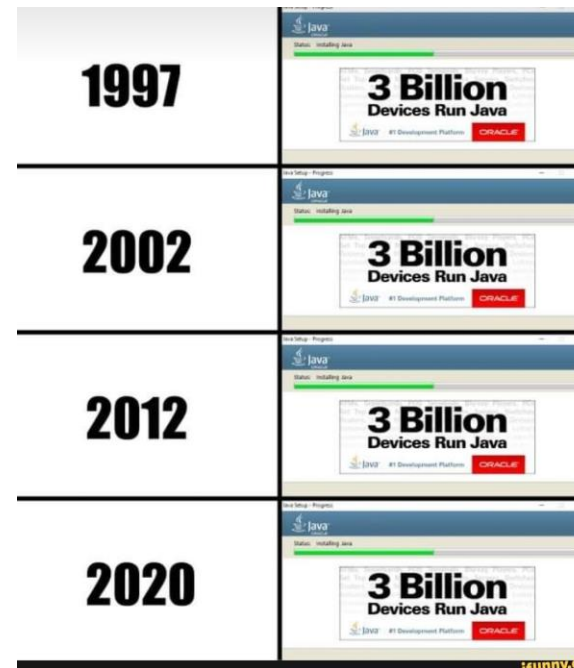
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# The heritage of CMM

- CMM: Customisable Memory Manager, what for?
- Managing memory: a hard task for a programmer!
- CMM automatise the process of managing memory
- Inspired the Java garbage collector
- Developed at the University of Pisa by Prof. Giuseppe Attardi



# Tarabella's fonds of TAUmus

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  - Papers and sketches

5) Al create e le sue opzioni

- Criteri generali (a. vincoli imposti su le opzioni, range di frequenze e durata, intervallo minimo..., la creazione dei vari reperti elaborati).

- Ripetizione (+ titolo) e realizzazione di un brano

- L'idea: con la massima dei comandi e delle opzioni: #####

è costituito a 4 reperti A, B, C, D : le opzioni:

---

A) LA1|20|VA|13|TA|0,0,0,0,0,0|DA1|,,20,20|FA1|,,100,120,,6|

B) LA1B1C1|20|TA|3,3,0,0,0,0|VA|10|TB|2,0,0,0,0,0|VB|10|  
TC|2,6,5,0,0,2,3|VC|10|  
DA1|,,40,40|FA1|,,55,130,,12|  
DB1|,,40,60,,20|FB1|,,163,190,,6|  
DC1|,,60,80,,13|FC1|,,175,200,,3|

C) LA120,2C12|20|TA|2,5,6,0,0,0,0|VA|12|TB|2,0,5,0,2,3,6|VB|12|  
TC|2,5,4,1,2,0,3|VC|12|  
DA12|,,40,40|FA12|,,55,130,,12|FA12|,,16,1|  
DB12|,,40,40|FB12|,,163,190,,6|PB12|,,13,7|  
DC12|,,40,40|FC12|,,140,215|PC12|,,90,,|

D) LA123B123C123|20|

---

A: una voce - durate uguali - veloce (20 secondi) TON.

B: Tre voci - 3 diverse durate, frequenze varie, tecnica più variata (20 secondi) VOC.

C: tre voci - 3 durate uguali, trinitone, e molte forme (20 sec.) MIX.

D: nove voci - tutto canale PERF.

**GRUPPO**

# Tarabella's fonds of TAUmus

- Three main categories:
  - Papers and sketches
  - Source code

Load BOURREE

PLAY

Goback

PLAY

Invert

PLAY

Invert

Modify F|+21

Chain BOURREE

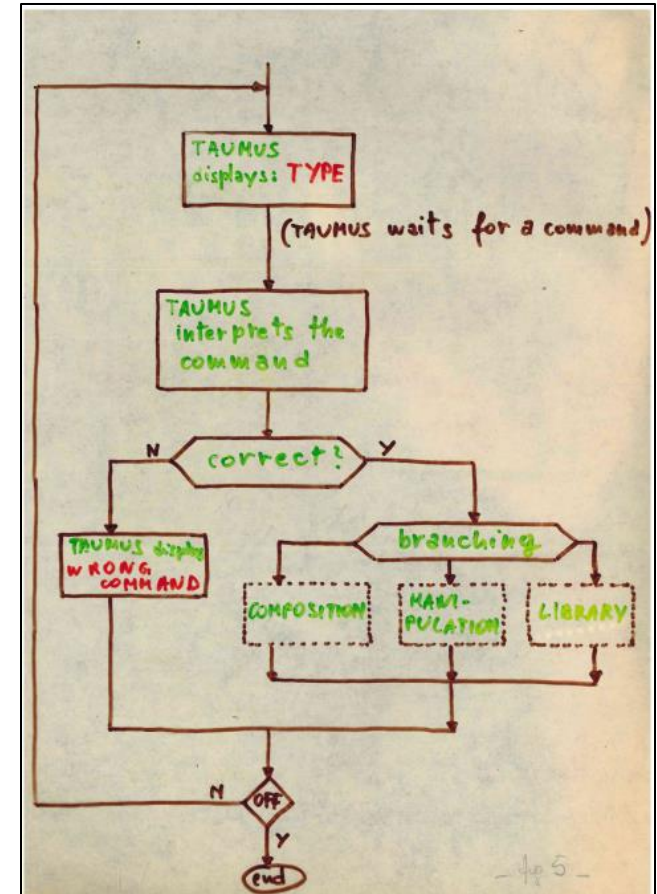
Mix 13,,, 3

PLAY

Save BOUR1

# Tarabella's funds of TAUmus

- Three main categories:
  - Papers and sketches
  - Source code
  - Project specifications



# Different kinds of Source Code



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- FORTRAN listings:
  - TAU2 was just an audio terminal: it didn't run code
  - Code ran on the CNUCE's IBM 370
  - These are (part of) the code of the TAUmus interpreter

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- TAUmus listings:
  - Hand-written, the actual code of music sessions
  - The interpreter was basically a terminal
  - The user could play music using the TAUmus commands

Attardi's CMM  
source code  
archive

# Attardi's CMM source code archive

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- Scarce raw material
  - The original archive
  - The accompanying email

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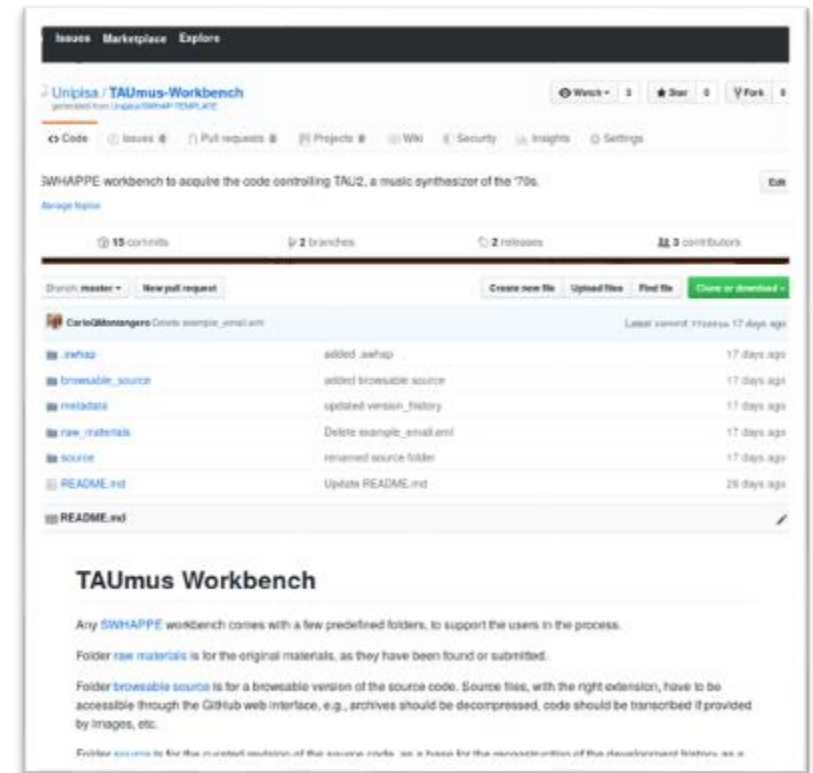
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```
Le sam. 2 mars 2019 à 12:11, Giuseppe Attardi <attardi@di.unipi.it> a écrit :  
  
CMM (Customizable Memory Management) è il conservative garbage collector  
per C++ che sviluppai per il progetto PoSSo (Polynomial System Solver).  
  
Il solver aveva delle fasi in cui venivano creati tantissimi oggetti  
temporanei, che potevano essere cancellati in un botto solo alla fine  
della fase.  
  
Segnalai CMM a Bill Joy nel 1994, quando mi disse che stava cercando un  
GC per un nuovo linguaggio che stavano sviluppando alla Sun Microsystems.  
  
Gli consegnai una copia dell'articolo presentato a USENIX C++ 1994, che  
riportava un link ftp da cui scaricare il codice:  
  
http://usenix.org/publications/library/proceedings/c++94/full\_papers/attardi.ps  
  
BTW, alla conferenza Bjarne Stroustrup fu colpito dal lavoro e mi disse  
che con il miglioramento delle tecniche di GC, stava ricredendosi sulla  
possibilità di introdurle nel C++.  
  
Qualche tempo dopo incontrai Ted Goldstein, del dipartimento Sun  
Engineering, che mi ringraziò, dicendo che avevano utilizzato il codice  
nella loro implementazione del linguaggio Oak, il nome che gli aveva  
dato James Gosling, guardando fuori dalla finestra del suo studio. Poi  
dovettero rinominarlo Java, per questioni di copyright.  
  
A quel tempo non usavamo sistemi di versionamento, ma ci eravamo fatti  
uno script noi per fare versioni.  
  
Eccoti un link a un tar che contiene diverse versioni:  
  
http://medialab.di.unipi.it/ftp/cmm.tgz  
  
Enjoy  
  
-- Beppe
```



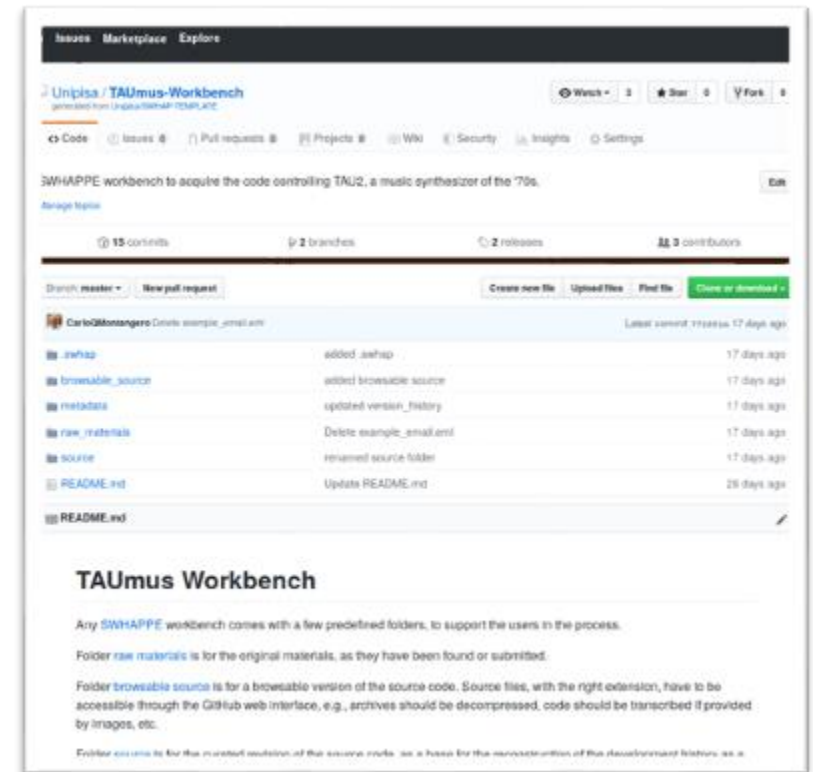
# The process, instantiated

- TAUmus Workbench is the (virtual) place where the work actually started



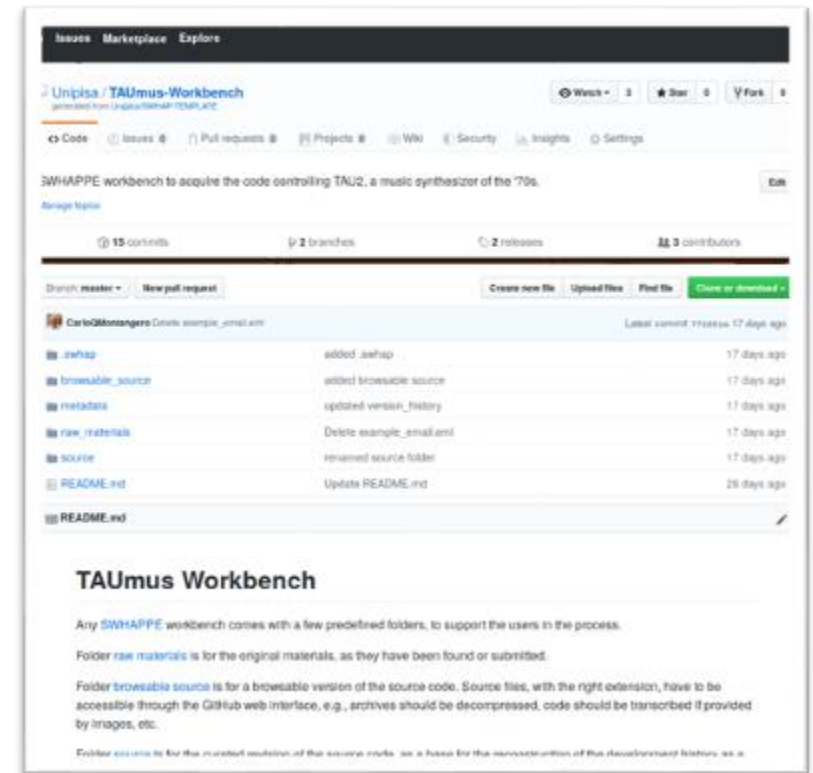
# The process, instantiated

- TAUmus Workbench is the (virtual) place where the work actually started
- The directory structure is inherited from the SWHAP template



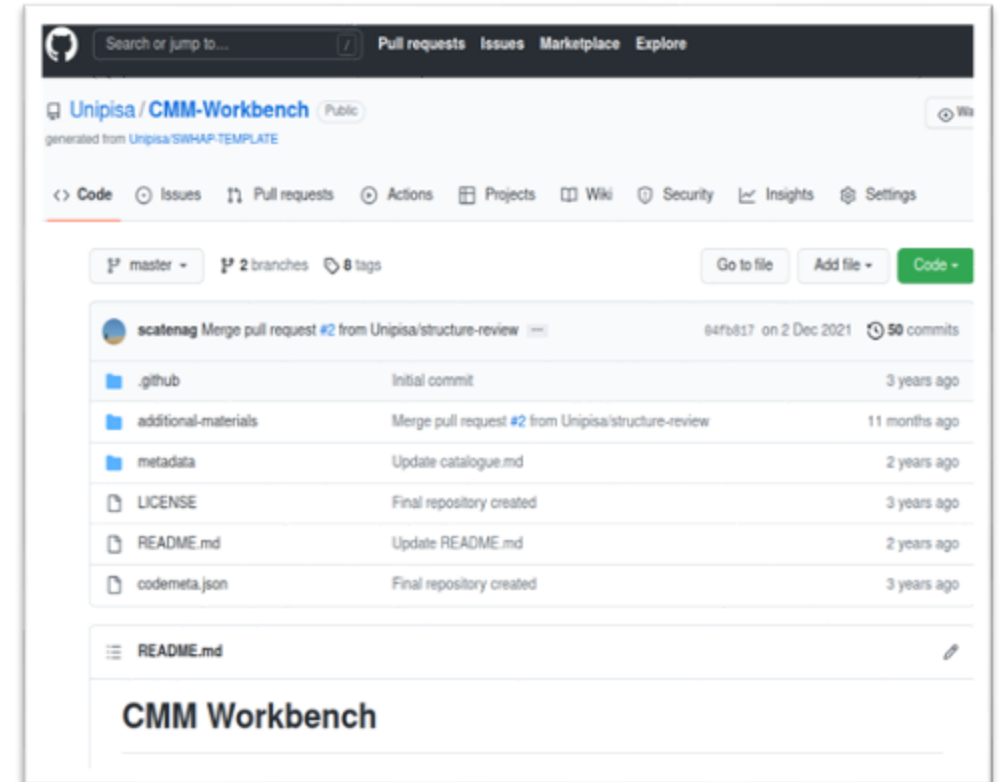
# The process, instantiated

- TAUmus Workbench is the (virtual) place where the work actually started
- The directory structure is inherited from the SWHAP template
- From here, we performed the process's steps



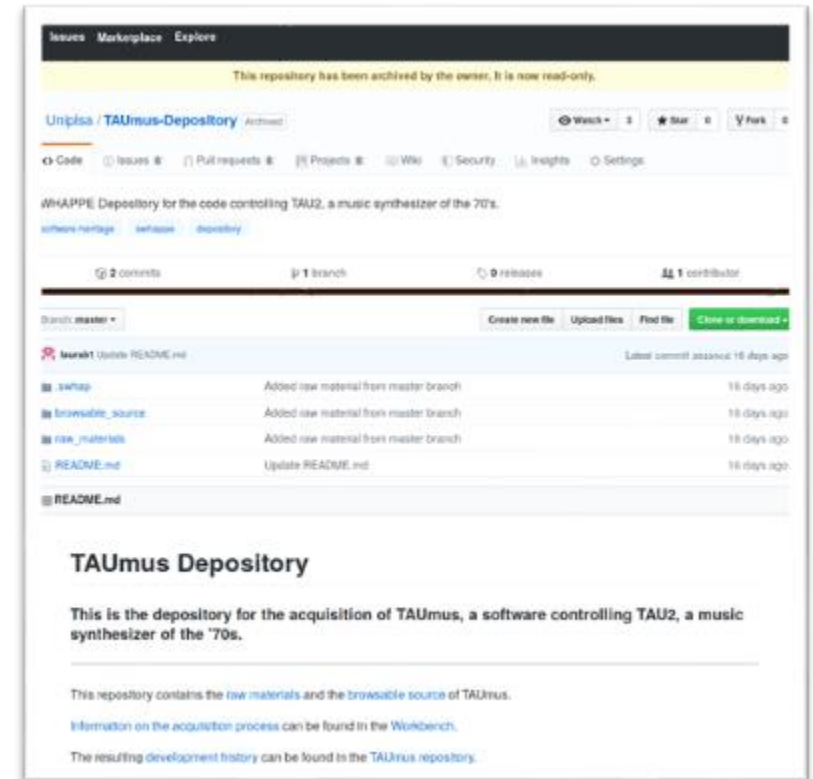
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- The same is done for CMM



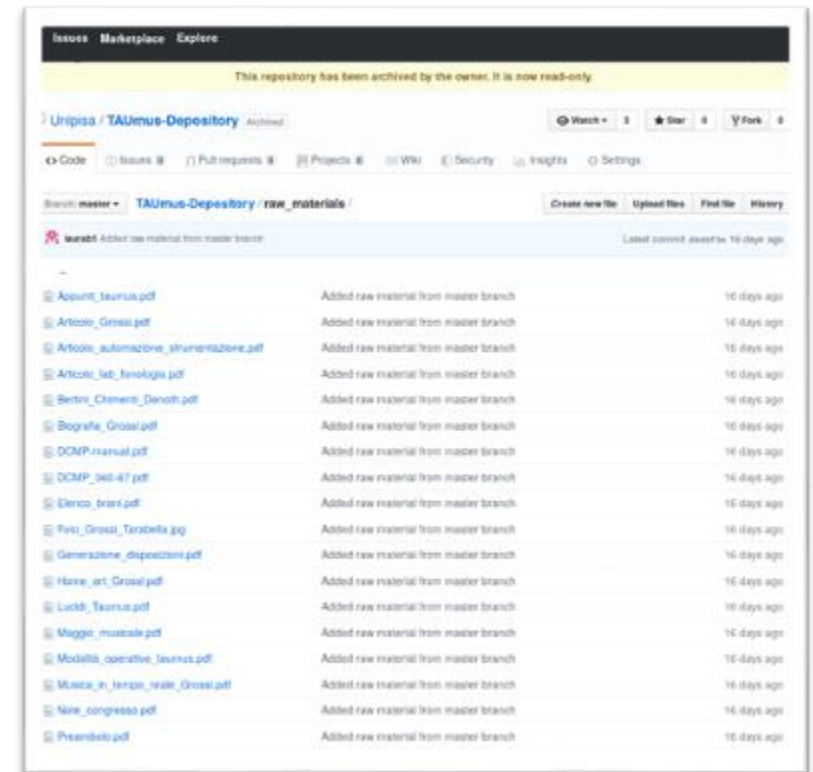
# The process, instantiated

- First we created the Depository



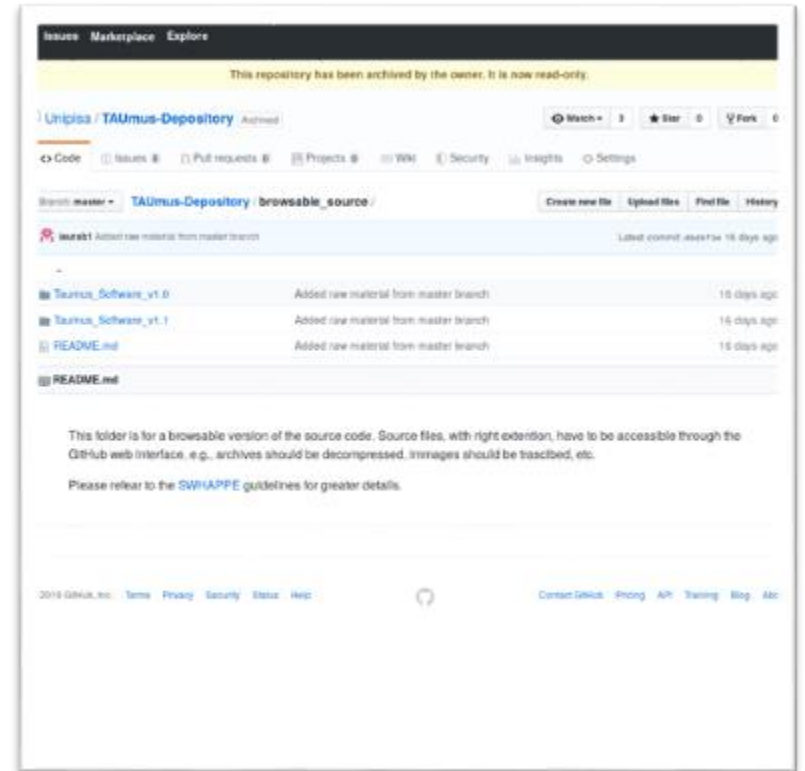
# The process, instantiated

- First we created the Depository
  - Here we have raw-material...



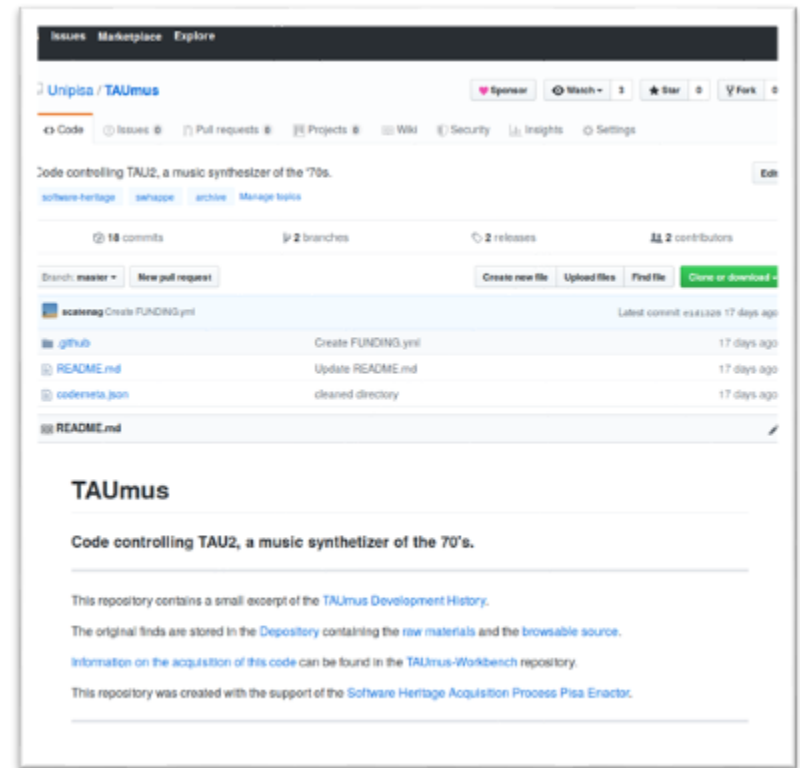
# The process, instantiated

- First we created the Depository
  - Here we have raw-material...
  - ...and browsable-source



# The process, instantiated

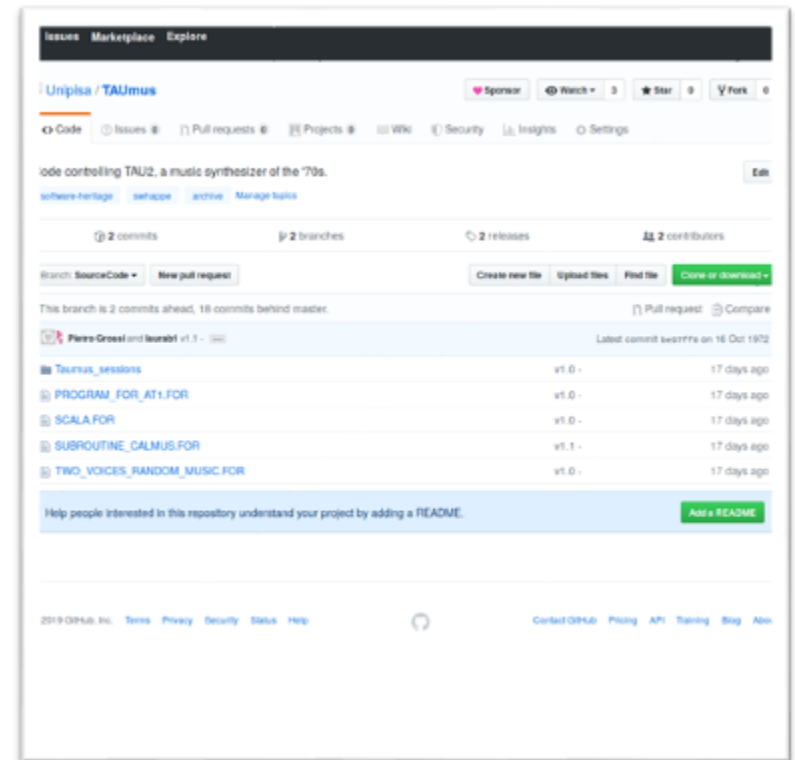
- First we created the Depository
  - Here we have raw-material...
  - ...and browsable-source
- Then we (re)created the development history





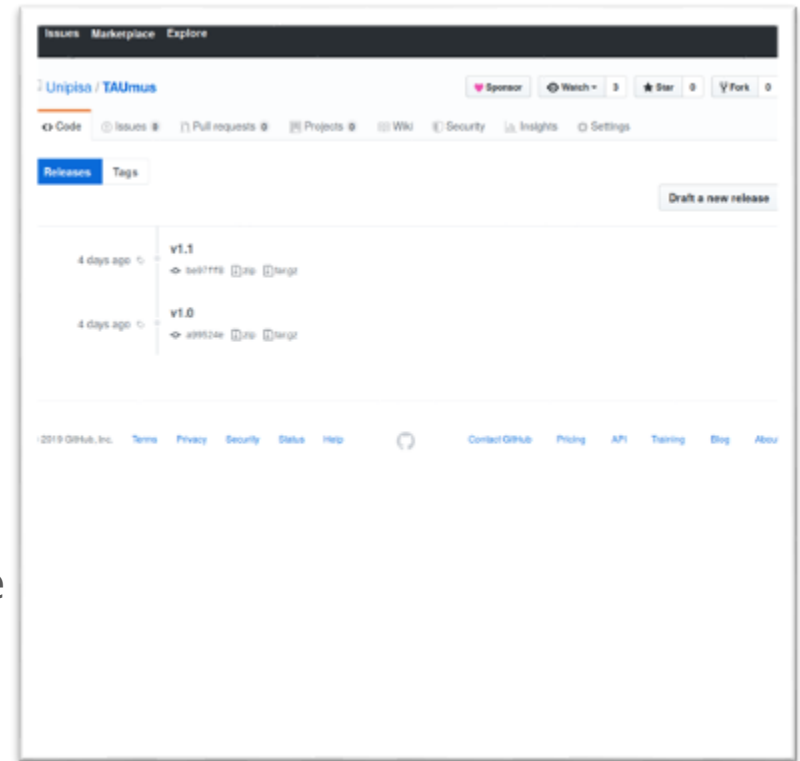
# The process, instantiated

- First we created the Depository
  - Here we have raw-material...
  - ...and browsable-source
- Then we (re)created the development history
  - The SourceCode branch contains the versioned code

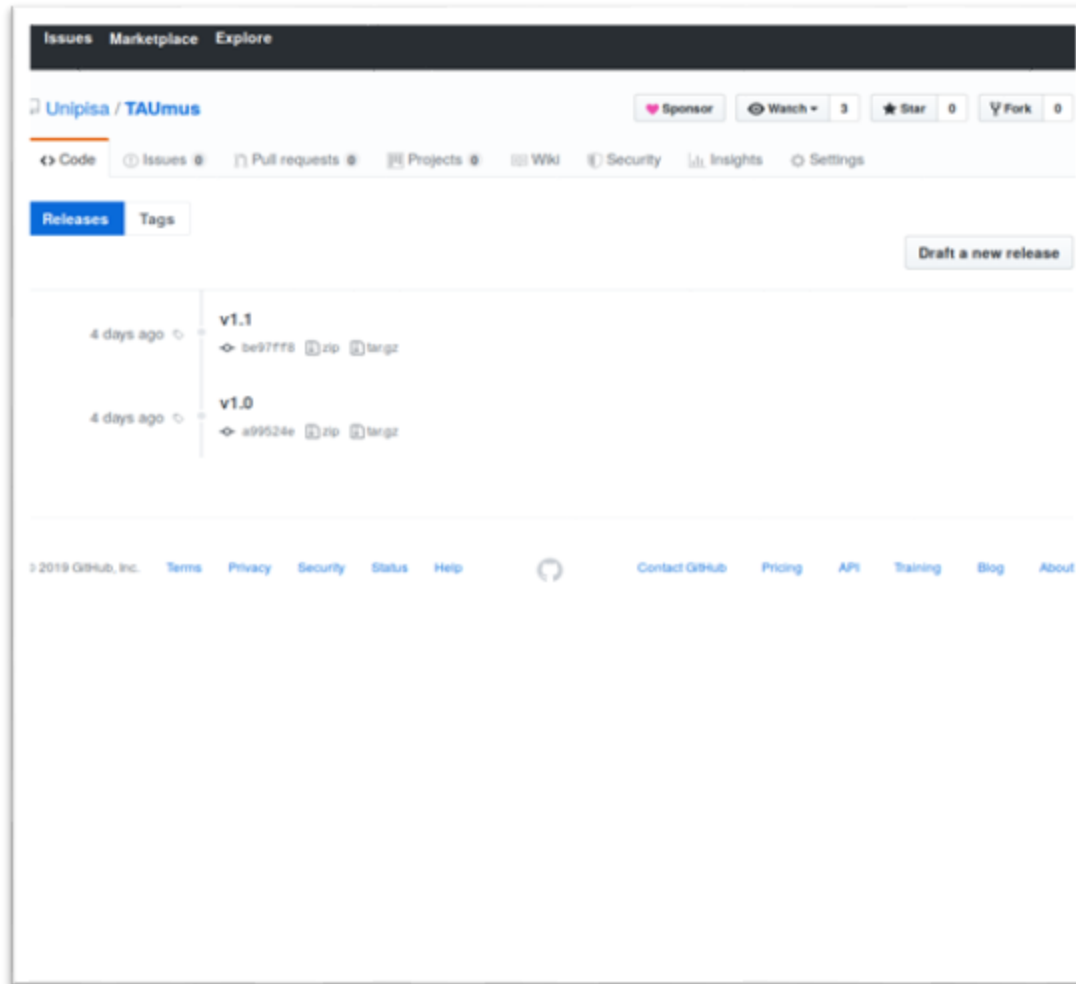


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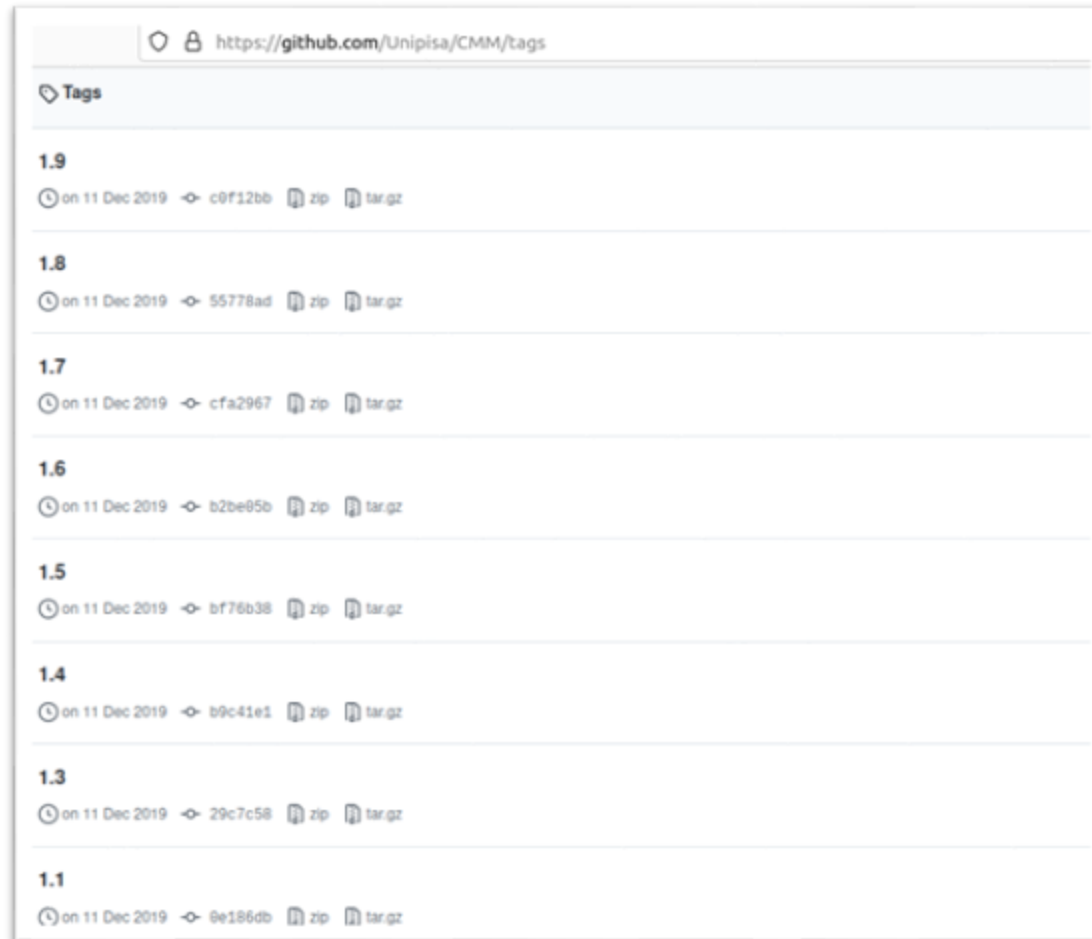
- First we created the Depository
  - Here we have raw-material...
  - ...and browsable-source
- Then we (re)created the development history
  - The SourceCode branch contains the versioned code
  - The development history can be seen by checking for releases



Spot the differences!



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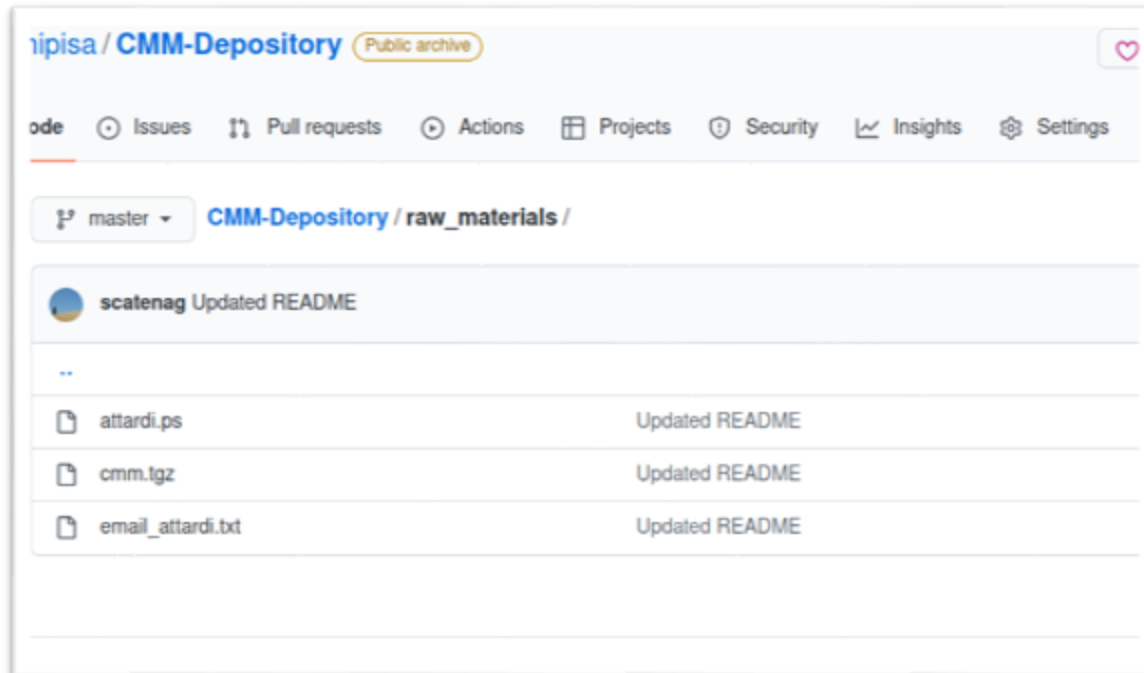
The screenshot shows the GitHub repository page for Unipisa/CMM, specifically the tags section. The URL in the browser is <https://github.com/Unipisa/CMM/tags>. The page lists seven tags, each with a version number, a date, a commit hash, and download links for zip and tar.gz files.

Version	Date	Commit Hash	Download Links
1.9	on 11 Dec 2019	c0f12bb	zip tar.gz
1.8	on 11 Dec 2019	55778ad	zip tar.gz
1.7	on 11 Dec 2019	cfa2967	zip tar.gz
1.6	on 11 Dec 2019	b2be85b	zip tar.gz
1.5	on 11 Dec 2019	bf76b38	zip tar.gz
1.4	on 11 Dec 2019	b9c41e1	zip tar.gz
1.3	on 11 Dec 2019	29c7c58	zip tar.gz
1.1	on 11 Dec 2019	0e186db	zip tar.gz

# Spot the differences!

- TAUMus: few code (FORTRAN listings and TAUMus scripts)
  - Both on paper!
  - Some extra work needed in order to digitally archive it
- CMM: the complete source code of the memory manager, archived by the creator and well versioned
  - The software is a complete and potentially running C++ program

Spot the differences!



Spot the differences!

master - TAUmus-Depository / raw\_materials /

scatenag crop and rotate 57

..

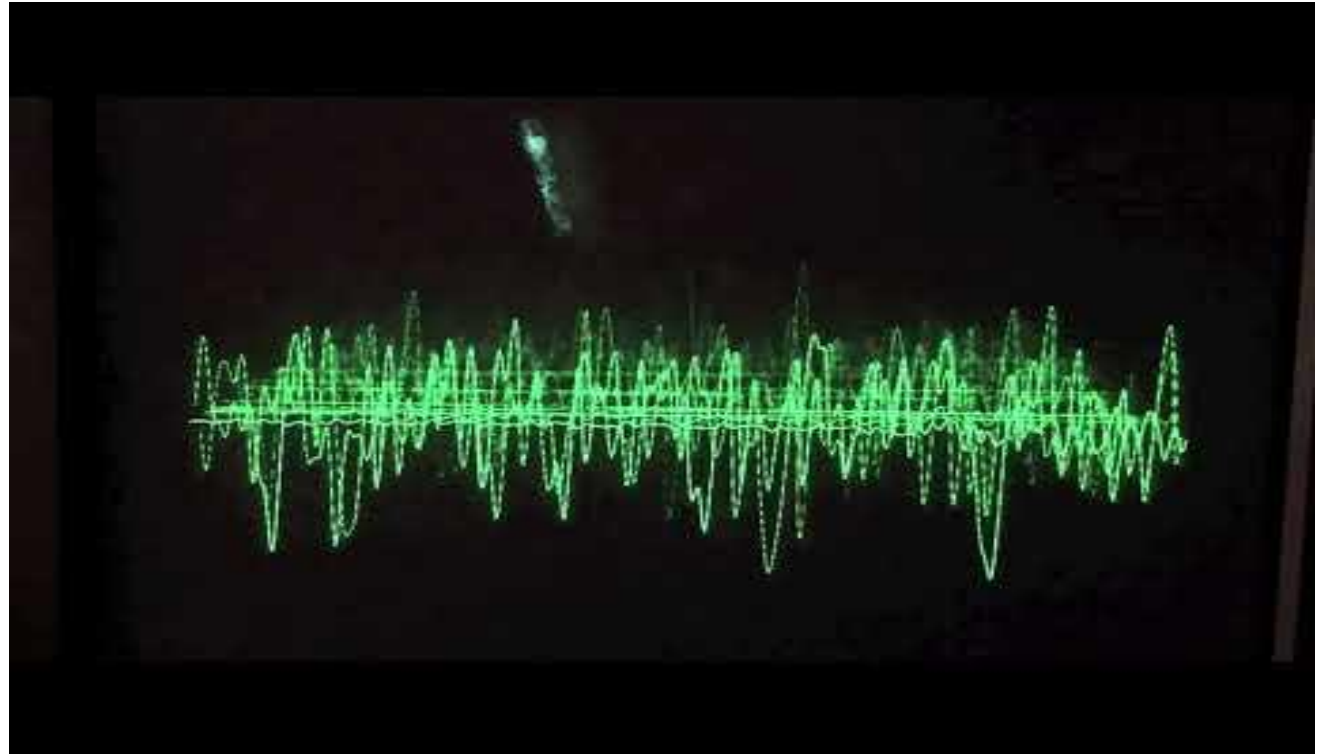
Appunti_taumus.pdf	crop and rotate
Articolo_Grossi.pdf	crop and rotate
Articolo_automazione_strumentazione.pdf	Added raw material from master branch
Articolo_lab_fonologia.pdf	crop and rotate
Bertini_Chimenti_Denoth.pdf	Added raw material from master branch
Biografia_Grossi.pdf	Added raw material from master branch
DCMP-manual.pdf	Added raw material from master branch
DCMP_360-67.pdf	Added raw material from master branch
Elenco_brani.pdf	Added raw material from master branch
Foto_Grossi_Tarabella.jpg	Added raw material from master branch
Generazione_disposizioni.pdf	Added raw material from master branch
Home_art_Grossi.pdf	Added raw material from master branch
Lucidi_Taumus.pdf	Added raw material from master branch
Maggio_musicale.pdf	crop and rotate
Modalità_operative_taumus.pdf	crop and rotate

# Spot the differences!

- TAUMus: a huge amount of rawmaterial
  - Photo, sketches...
  - All of it tells the story of the software
- CMM: few rawmaterial
  - The story of the software is narrated by the software itself

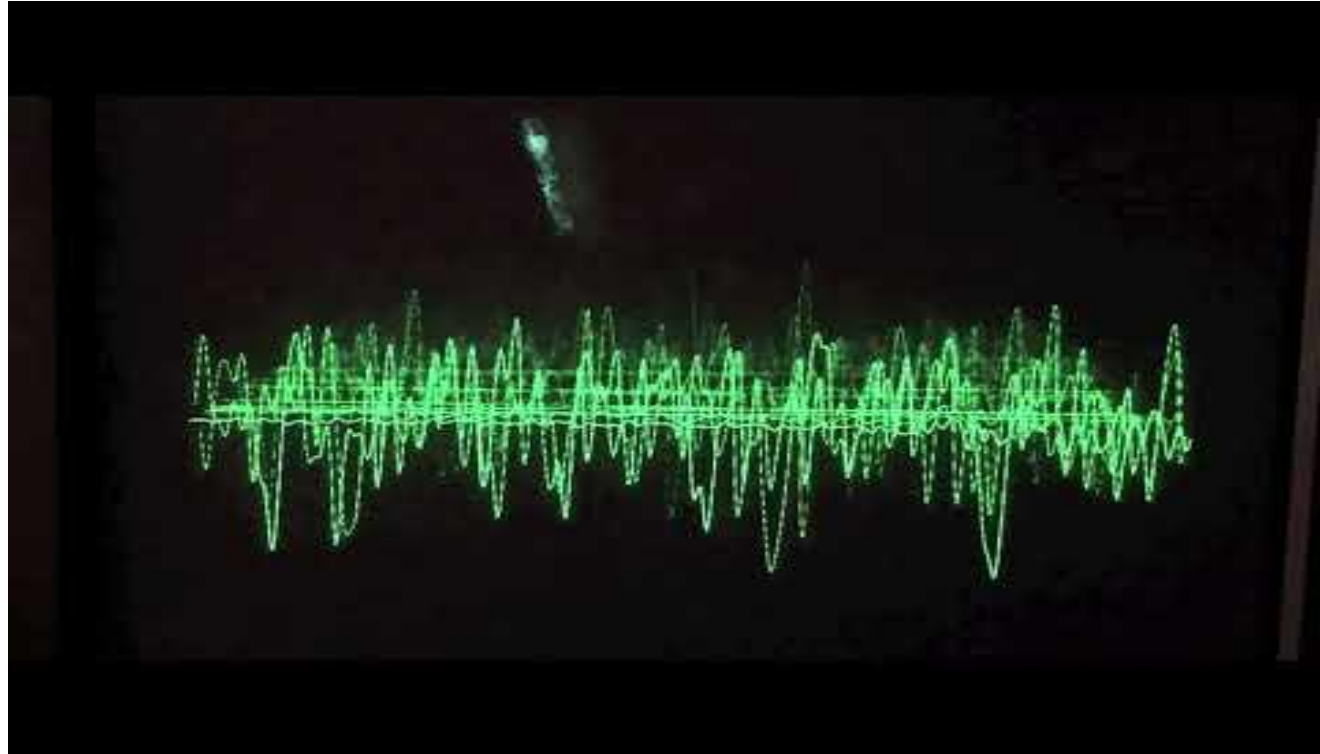


TAUmus lives  
back!



*Thanks to Massimo Magrini, Signal and Image Laboratory, CNR*

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Thank you!