

# Generating Time Code Information from Analog Sources

presented at 118th AES convention

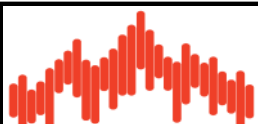
Dr. Frank Jordan



[www.Dr-Jordan-Design.com](http://www.Dr-Jordan-Design.com)



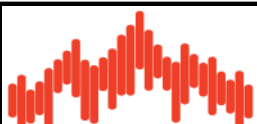
[www.Soundtitles.dk](http://www.Soundtitles.dk)



Dr. Frank Jordan

# System for Generating Synchronized Add-On Information for Cinemas

- Making foreign languaged films accessible to local audiences is vital for entertainment, education and cultural exchange



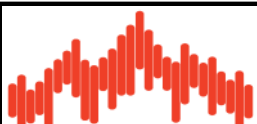
# Two approaches: dubbing and subtitling

- Dubbing

Direct translation replacing the original soundtrack to the audience native tongue.

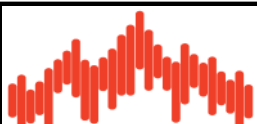
- Subtitling

Projecting of text translations to the screen



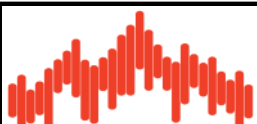
# Dubbing

- Instant and effortless understanding of the dialogs
- Typically done with great care and excellent results by actors, translators and engineers.



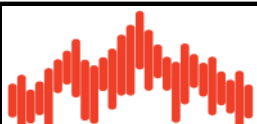
# Disadvantages

- Any film will suffer artistically. It is not the original voice.
- Films from a different culture played in your own language can be a funny experience
- Professional dubbing is very expensive
- People don't get acquainted to foreign languages if they don't **hear** it



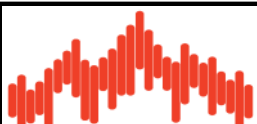
# Subtitling

- Original soundtrack remains unchanged
- Lower cost for production
- Several countries have a long tradition

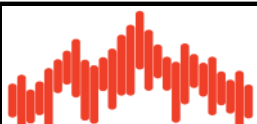


# Disadvantages

- Interference with screen image
- You have to read it
  - A simple 1:1 translation is mostly impossible even for trained people
  - Some countries developed „summary captioning“
  - People with limited reading capabilities are left behind



- In some parts of the world there are large groups of reading impaired or even illiterate people
- In Europe it's more a question of getting acquainted with our different languages, reflecting a variety of cultures.

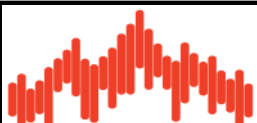






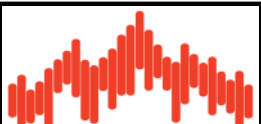
# Third approach

Imagine going to the cinema and have a pleasant, professional, human voice reading the subtitles –or translating- right into your ear, while you can still enjoy the original soundtrack.



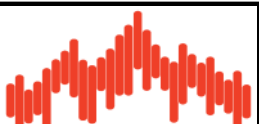


- The Soundtitles system provides assistance for those who need it.
- It doesn't replace the soundtrack
- It offers a supplemental source of input
- You get the original sound and the meaning



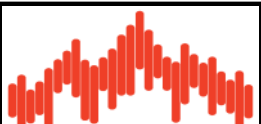


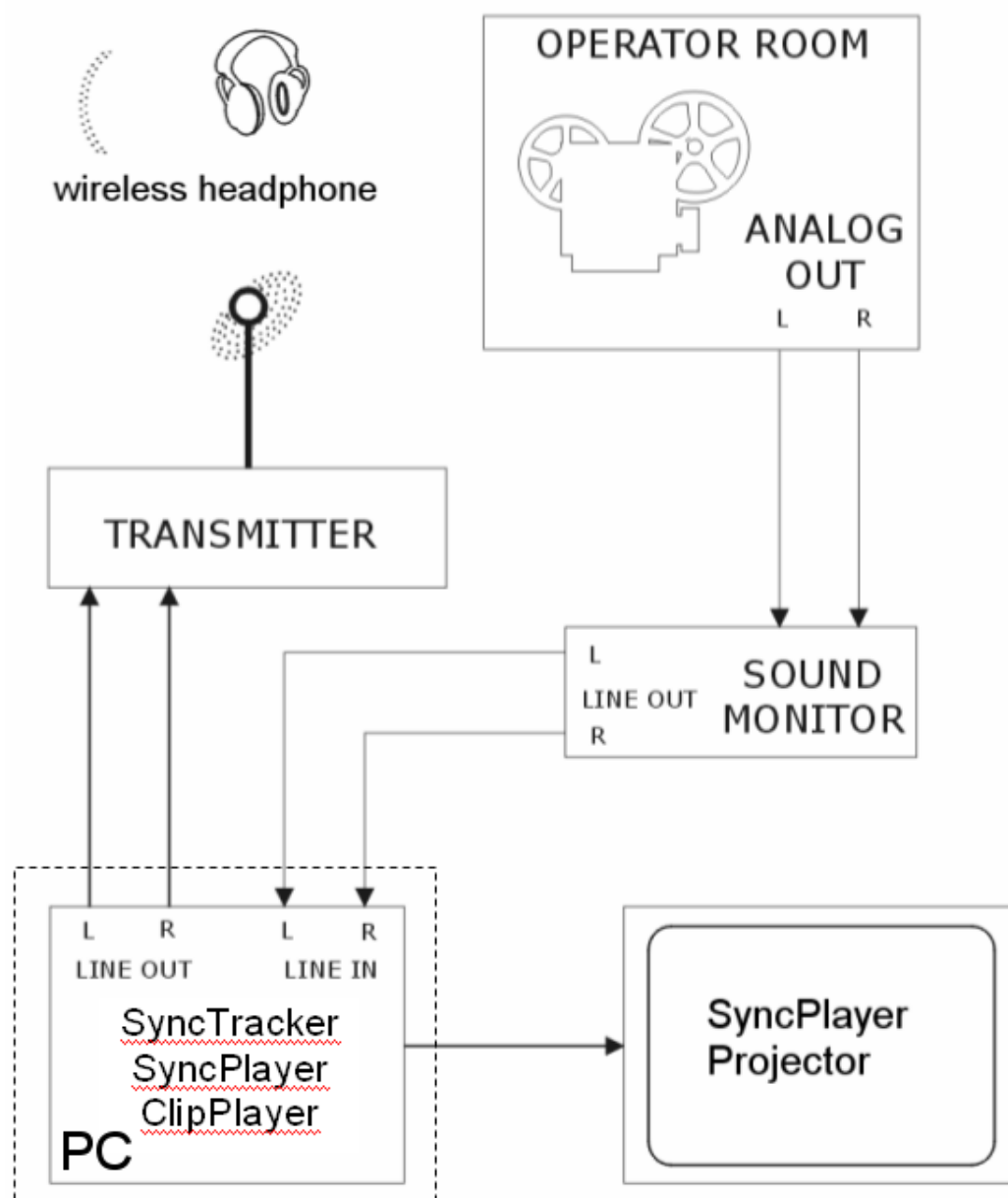
- With full digital equipped cinemas it would be easy to implement
- But most installations are **analog**.
- Due to the high investment for operators, the path to digital is long.



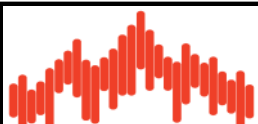
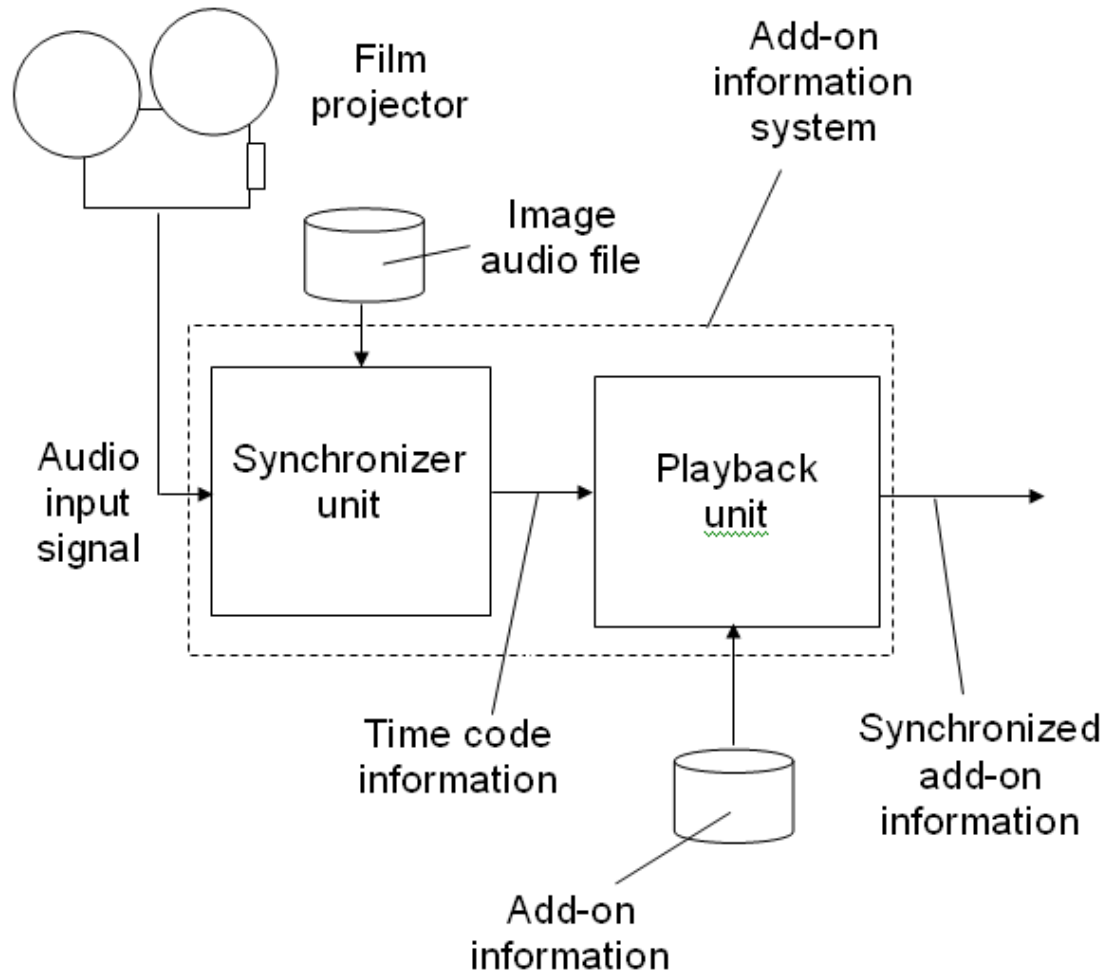


- The Soundtitles system is a cheap add-on to any existing cinemas
- It basically generates time-code information for playing soundclips or even projecting subtitles itself.





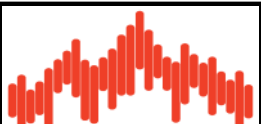
# Details





The Soundtitles system contains 3 components

1. SyncTracker: generates timing information
  2. ClipPlayer: Plays audio clips
  3. SyncPlayer: Projects subtitles or images
- All components are implemented on a standard PC

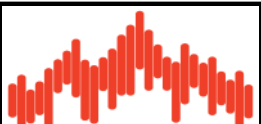






## Key features

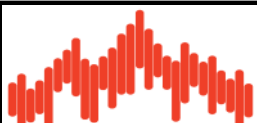
1. High flexibility for any projector
2. Easy to use
3. Low cost. No DSP required.
4. Easy to install. Even portable.
5. No special film copy required for subtitles



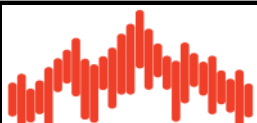
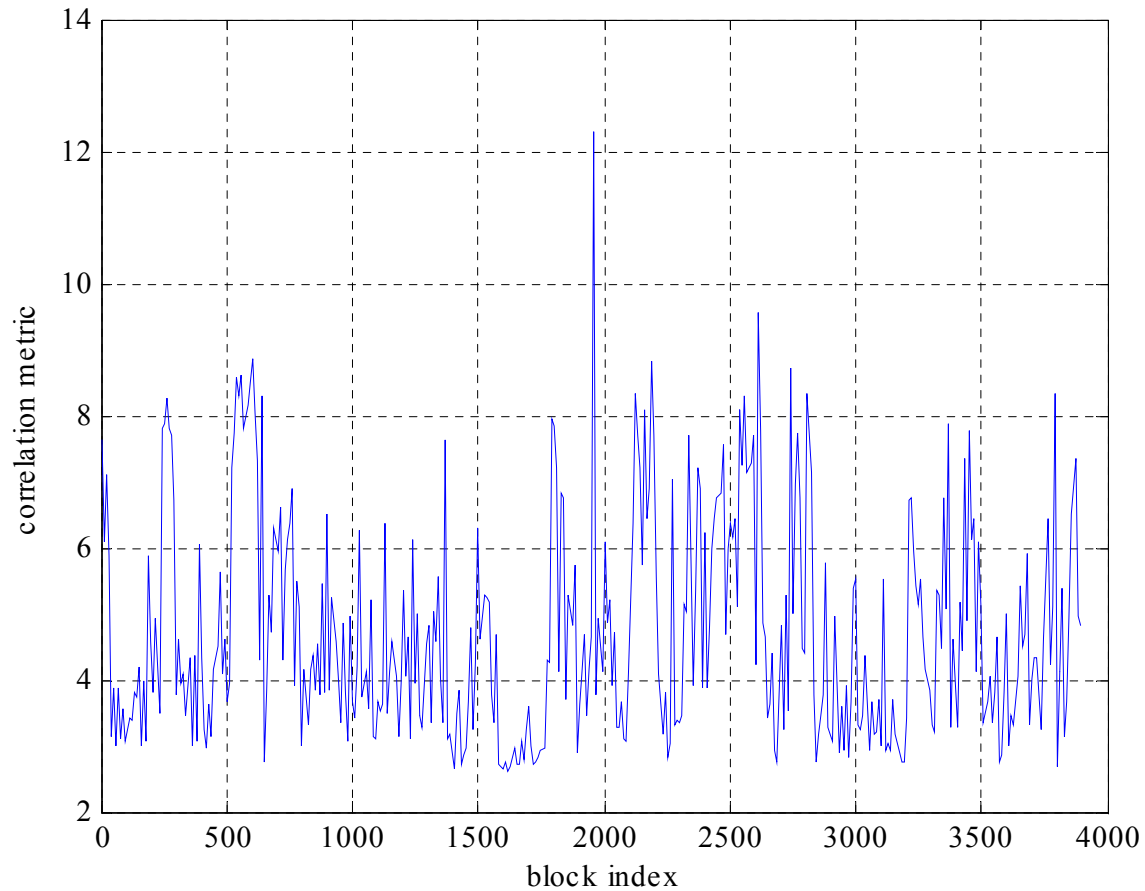
# Core technology

Comparison of two streams via cross-correlation  
Similarity metric  $s(n)$

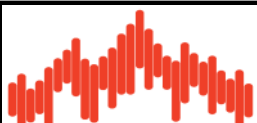
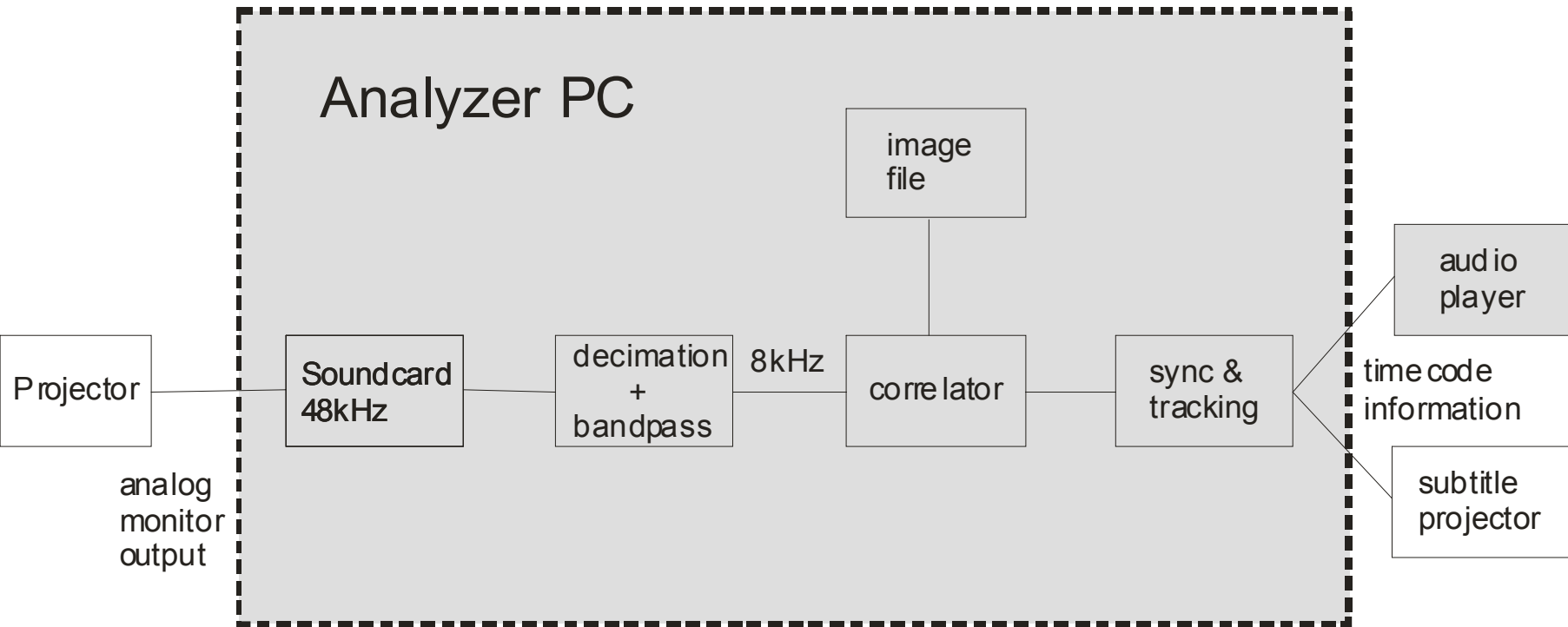
$$s(n) = \sum_{k=1}^N x(k)y(k+n)$$



# Correlation example

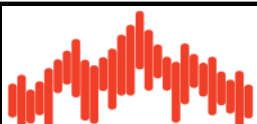


# Signal processing



# Artefacts from projectors

- Pitch: even low offsets lead to complete out of sync after 2h
  - Pitch estimation and compensation with tracking
- Clicks, crackles, noise: Statistical analysis+consistency check of timing
- „Broken film“: will re-sync automatically but also an emergency manual mode



# Image file

- Digital representation of the original soundtrack.
- Compression techniques allow to store several hours on a single CD for easy distribution



# User interface

Soundtitles

Synctracker SP  
® VER. 1.0

FILM **5th Element**

DUR. **02:13:23:23**

TIME **00:10:12:20**

PLAY FILE 1  
**Danish**

PLAY FILE 2  
**German**

SET TIME CODE  
**00:00:00:00**

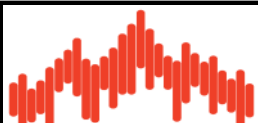
MANUAL SET ANALYZER

SYNC PLAYER SOUND SET

LOAD AUTO PLAY

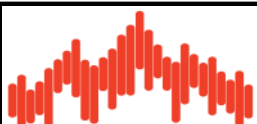
INPUT 0dB -90dB

OUT 1 OUT 2



# Summary

- Dubbing, subtitling
- A third approach->Soundtitles
- Soundtitles system overview
- Implementation





Thank you

