



Semantic Fingerprinting : Automated Identification and Processing of Audiovisual Material

(Contact: info@limecraft.com)

000. Executive summary

Limecraft

- Incorporated May 2010
- Software for Professional Video Production (Television, Film, Corporate)
- Customers : post facilities and broadcasters in 10+ countries

An intelligent approach to Media Asset Management

- Cloud-based – available on demand
- **Interconnect “Digital Isles”** – leverages pre-existing asset management
- Enables you to find the the needle in the haystack

Addressing the top issues in professional video production

- Computer Assisted Logging for more efficient **Search and Retrieval**
- **Secure Online Sharing** between all stakeholders
- Better metadata = better visibility = more value for the producer



000. Limecraft



Exchange scripts, text and other production data



Upload Video material In any format



Real-time feedback by Executive Producer, Sponsor, Security,...



Limecraft Flow

- Material Transfer
- Workflow Mgmt
- Transcoding
- Transcription
- Traceability

Limecraft flow enables you to process more material in less time, whilst improving the quality of the product



Search and Retrieval



Collection management



Move collections back and forth Avid, Adobe Premiere and FCP

MECRAFT
creativity

Key Issues

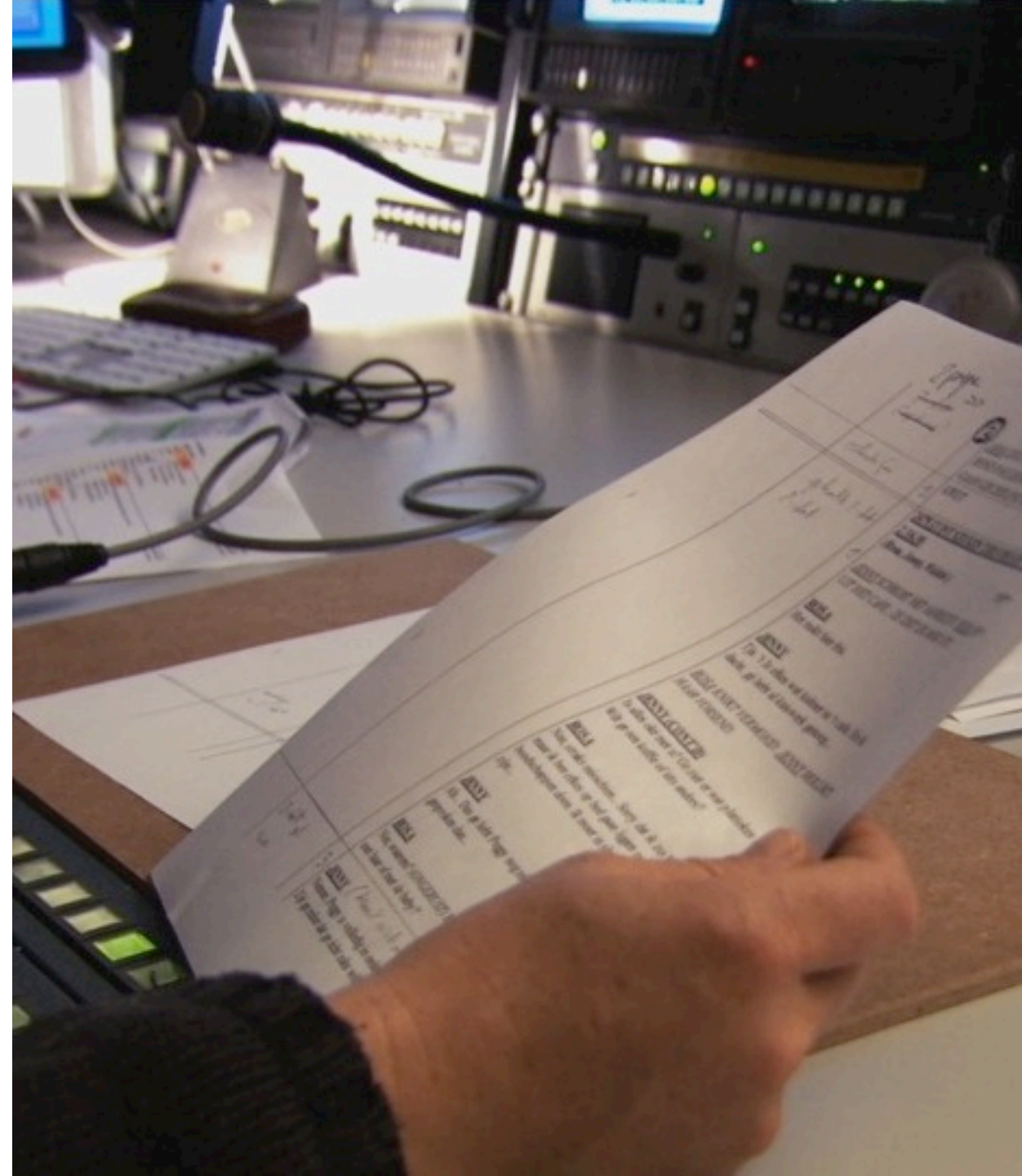
- Unstructured information
- Content is hard to find
- Limited collaboration potential

Traditional methods don't scale

- Manual transcription and “annotation”
- “Digital Isles” – data duplication
- Excessive file transfers

Challenge

- More input from different sources
- More output to different destination
- *Find the needle in the Haystack(!)*



LIMECRAFT FLOW

SCREENPLAYS

aflevering34

aflevering39

aflevering41

aflevering42

1. INT. APPARTEMENT DRIES - SLAAPKAMER DRIES
S - DAG 27 / 8

2. INT. SURFCLUB B04 - DAG 27 / 14 / 8

3. INT. APPARTEMENT DRIES - LEEFKAMER - DAG 27 / 2 / 8

4. INT. SUGARFOX NV - KANTOOR LIBELULA - DAG 27 / 10 / 8

5. INT. SURFCLUB B04 - DAG 27 / 14 / 8

Create

Replace Script

1. INT APPARTEMENT DRIES - SLAAPKAMER DRIES
DAG 27

JANA ziet Dries' verbazing.

JANA
Is daar iets mis mee?

DRIES
Wat doet je opa precies voor die Libelula?

JANA
Onderzoek. Naar wat allemaal weet ik niet.

DRIES
Ik zou toch eens met hem willen praten.

JANA
Als hij terug is... Je weet dat hij in

Change type

SELECT ALL

MORE

No material

Find material below and drag it up here

In: library

ALL FILES

READY

NOT AVAILABLE

INGESTING

FAILED

UNASSIGNED

COLLECTIONS

STORIES

SCREENPLAYS

search

88 results

A008C022_160318_R0V2_web...
33.7s 5/9/2016

A008C001_160318_R0V2_web...
20s 5/9/2016

A007C023_160318_R0V2_web...
41.5s 5/9/2016

A007C022_160318_R0V2_web...
56.2s 5/9/2016

A007C021_160318_R0V2_web...
1.2m 5/9/2016

ENTER SCREENPLAY NAME

State of the Art

Limecraft already replaces different tools for offload, encoding, dailies and ingest, but...

- Shot identification via clapperboard
- Traceability through logging by Script supervisor
- Manual pre-cut (Linking shots and scenes)

Facts

- 200 shooting days
- 500 hours of material/50.000 shots
- 1 to 2 edit suits for “offline edit”

Opportunity

- Cost 100.000 – 150.000 EUR for offline edit
- Dailies available 1-3 weeks after shoot
- Shorter feedback loop to improve quality



002. Solution – Semantic Fingerprinting

Up to date

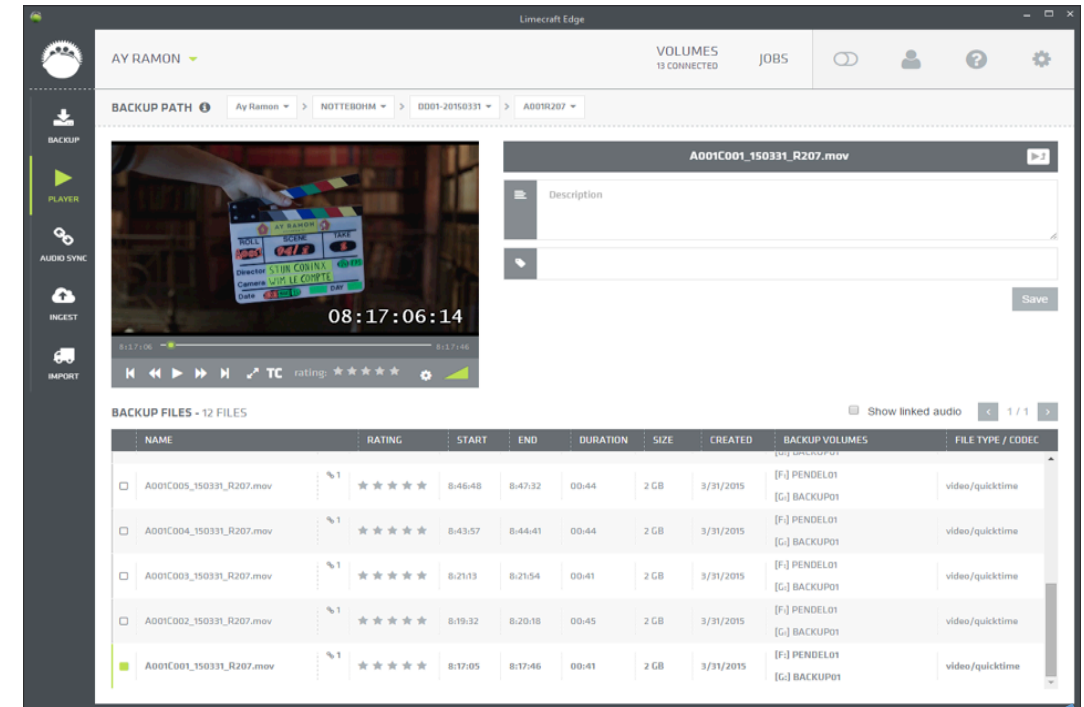
- Single pipeline for offload and encoding
- Automated audio sync and colour correction
- Computer assisted ingest

Achieved

- ✓ Better Security through shorter flow of raw material
- ✓ Increased efficiency (time, €)
- ✗ *Improved quality*

Secret Sauce : Link scenes and shots automatically so that the rough cut can be reviewed earlier in the process

See as well “The Case for Electronic Script-Based Collaboration”; SMPTE Mot. Imag. Journal; October 2014; 123:(7) 27-33



002. Solution – Semantic Fingerprinting

Hardware

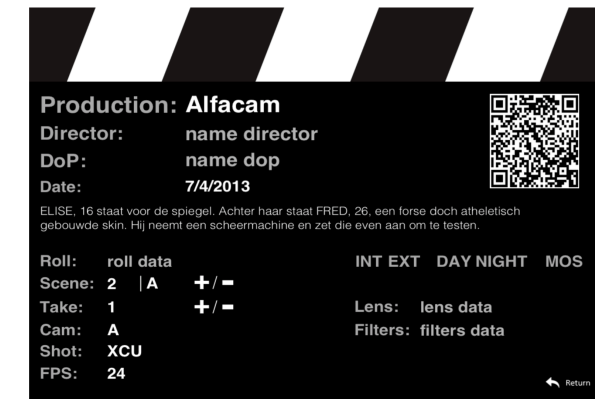
- + Correct
- Expensive
- Hard to implement – nobody wants to pay for it

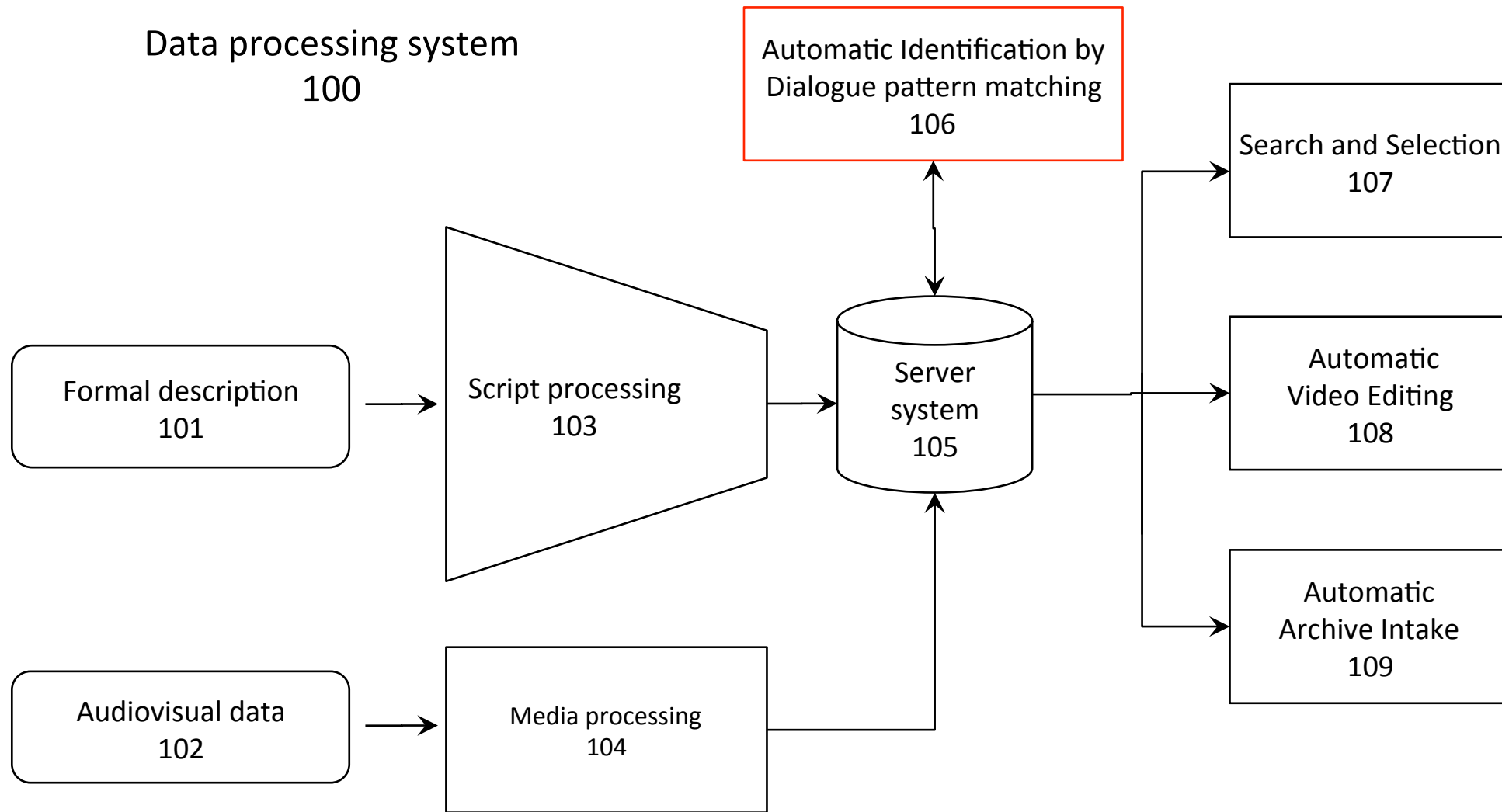
Software

- + Correct
- + Cheap
- Hard to implement – nobody wants to use is

Semantic Fingerprinting

- + More or less correct (“Good enough”)
- + Cheap
- + No additional interaction required





Belgian Patent 2016/5404; European Patent Pending

002. Solution – Semantic Fingerprinting

INT. JEEP – FAVORING JOE CHACO #1

JOE drives recklessly. ANDI sits next to him,
an attractive girl in her mid-twenties. #2

ANDI
(shouting) #3
How much longer?

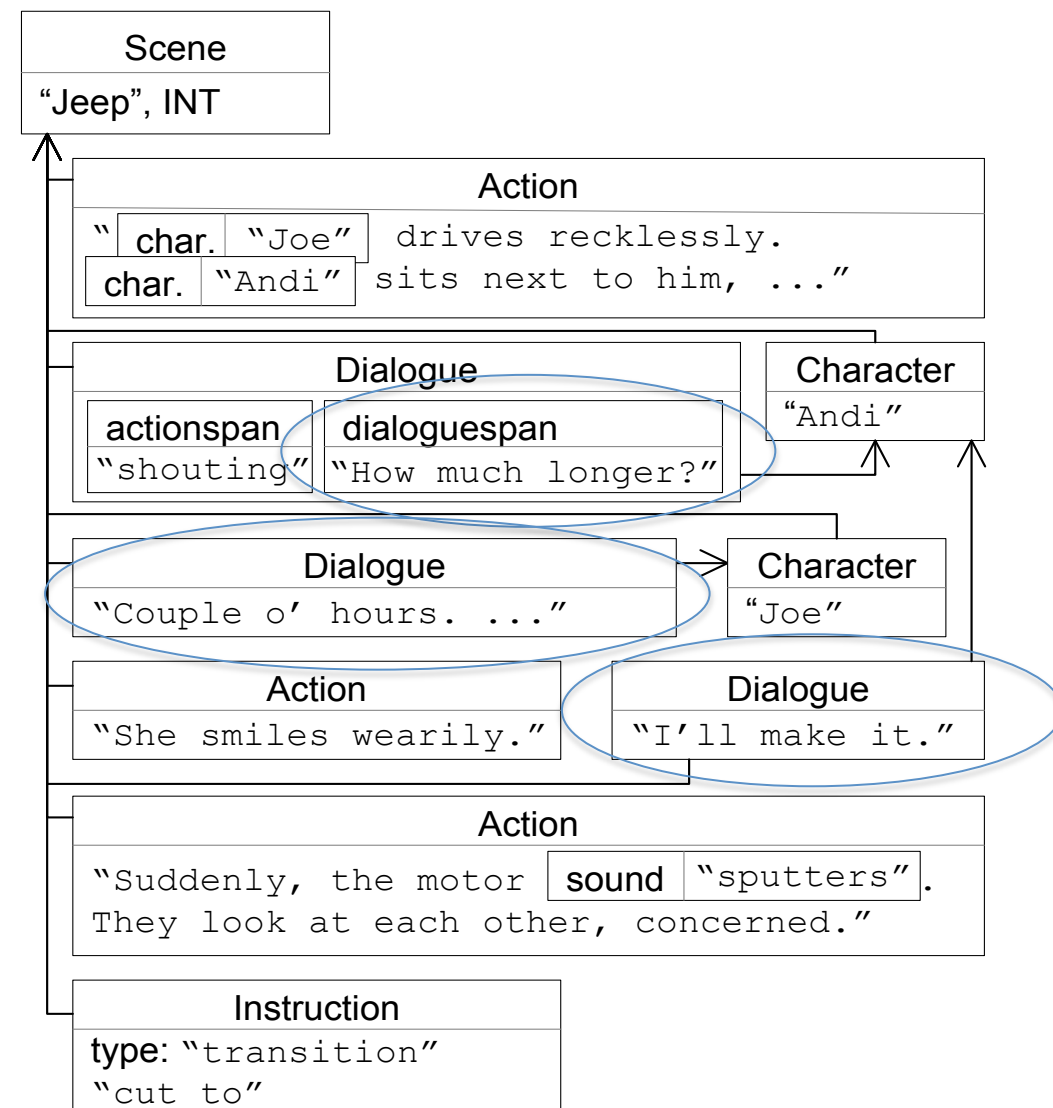
JOE
Couple o' hours. You okay? #4

She smiles wearily. #5

ANDI
I'll make it. #6

Suddenly, the motor SPUTTERS. They look at
each other, concerned. #7

#8 CUT TO:





◀ LIBRARY

A001C007_160317_R0V..



00:00:00:00 00:01:17:10



Speaker 1

Speaker 2

⌚ TIMELINE



≡ TRANSCRIPT

00:00:19



Speaker 1

19 dat ik 5.

01s

Speaker 2

Ik heb goed nieuws.

01s

Speaker 2

Jouw dochter was heel blij toen ze mensen

03s

Speaker 2

en ze was nog blijer toen ze hoorde dat het goed met jou ging. Hè.

04s

Speaker 1

Maar mijn geduld geraakt nu nog wel.

02s

“ QUOTES

002. Solution – Semantic Fingerprinting

CLIP A001C001

Scene_id	Variation	Percentage
6236	171.16666666666666	28.57142857142857
6228	623.3333333333333	14.285714285714285
6230	36.0	9.523809523809524
6275	121.0	9.523809523809524
6257	1936.0	9.523809523809524
6232	0.0	4.761904761904762
6255	0.0	4.761904761904762
6263	0.0	4.761904761904762
6282	0.0	4.761904761904762
6300	0.0	4.761904761904762
6227	0.0	0.0
6229	0.0	0.0
6231	0.0	0.0
6233	0.0	0.0
6234	0.0	0.0
6235	0.0	0.0
6237	0.0	0.0
6241	0.0	0.0
6242	0.0	0.0
6243	0.0	0.0
6244	0.0	0.0

Calculate “dialogue pattern”

- Using (tran)script
- Extract dialogue fragments
- Clean
- Reduce to a set of most representative concepts

Identification method

- Compare shot with all scenes
- Ranking according to probability
- Highest probability identifies the shot

SCREENPLAYS

aflevering34

aflevering39

aflevering41

aflevering42

ENTER SCREENPLAY NAME

ER - DAG 27 19 / 8

7. INT.APPARTEMENT DRIES - LEEFKAMER - NACHT 27 14 / 8

8. INT.APPARTEMENT DRIES - SLAAPKAMER DRIES - NACHT 27 2 / 8

9. INT.HUIS ROOS - SLAAPKAMER ROOS - NACHT 27 10 / 8

10. INT.SUGARFOX NV - M BLOK - CEL KAREL - NACHT 27 4 / 8

Create

Replace Script

10. INT SUGARFOX NV - M BLOK - CEL KAREL NACHT 27

Karel ligt op zijn bed. Met de ogen open. Als hij de celdeur hoort ontgrendelen, gaat hij rechtop zitten. De bewaker laat LIBELULA binnen. Ze ijkt Karel met vlammende blik aan.

LIBELULA

Je dochter is blij dat het zo goed met je gaat.

Karel geeft geen krimp.

LIBELULA

Mijn geduld raakt op, Karel. Ik geef je nog 48 uur.

(dan bedreigend)

Je wilt toch niet dat je familie iets overkomt? Of nog erger, lieve Jana, je enige kleinkind...

Change type

SELECT ALL

A001C009_160317_R0V... 1.4m 5/9/2016

A001C008_160317_R0V... 1.5m 5/9/2016

A001C007_160317_R0V... 1.3m 5/9/2016

A001C006_160317_R0V... 1.1m 5/9/2016

A001C005_160317_R0V... 1.4m 5/9/2016

A001C004_160317_R0V... 32.7s 5/9/2016

In: library

28 results

ADVANCED FILTERS

In: library

Type

Rating

Search in

Tags

Uploaders

A008C015_160318_R0V... 3.6s 5/17/2016

A008C014_160318_R0V... 51.8s 5/17/2016

A008C012_160318_R0V... 1.2m 5/17/2016

A008C011_160318_R0V... 58.6s 5/17/2016

002. Solution – Semantic Fingerprinting

LIMECRAFT FLOW Productions / ClipMetadata Testing

In: library search 522 results

ALL FILES

- ✓ READY
- ✗ NOT AVAILABLE
- ⚙ INGESTING
- ✗ FAILED
- 📁 UNASSIGNED




> COLLECTIONS

> STORIES



> SCREENPLAYS

SCENE 221




Shot 221.1 3 takes MORE ACTIONS

		
A689C003_150423... 37.4s 4/21/2016	A689C001_150423... 39.4s 4/21/2016	A689C002_150423... 34.2s 4/21/2016



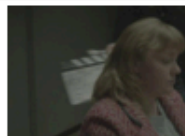
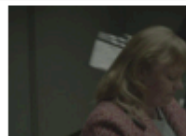
Shot 221.2 2 takes MORE ACTIONS

	
A689C004_150423... 1.1m 4/21/2016	A689C005_150423... 53.4s 4/21/2016

Shot 221.3 3 takes MORE ACTIONS

		
A689C009_150423... 52s 4/21/2016	A689C007_150423... 46.3s 4/21/2016	A689C008_150423... 48.5s 4/21/2016

Shot 221.4 4 takes MORE ACTIONS

			
A689C011_150423... 43.1s 4/21/2016	A689C012_150423... 39.7s 4/21/2016	A689C013_150423... 38.8s 4/21/2016	A689C010_150423... 42.6s 4/21/2016

003. Use Cases

Ay Ramon!

High-end Feature Film

Ay Ramon

- Dutch-Spanish
- Lot of speechless clips
- Singing
- 1200 clips

Results

- 50% linked



003. Use Cases



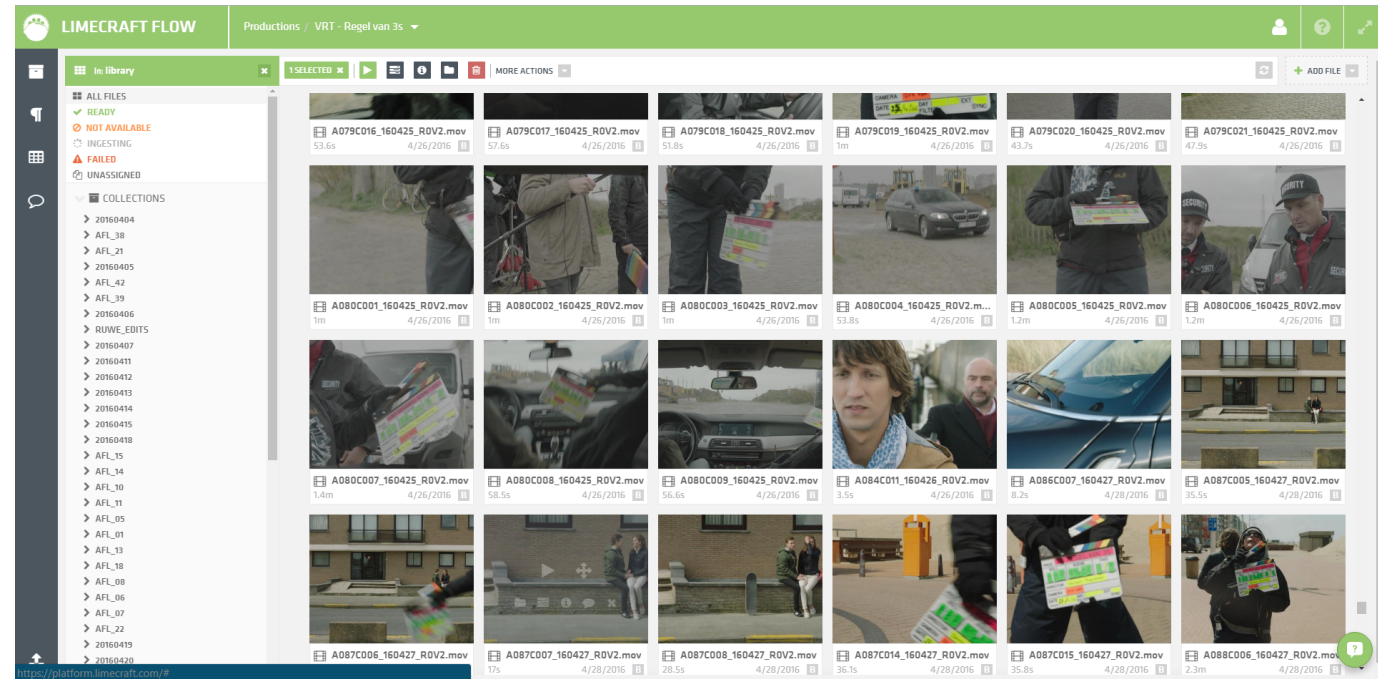
Television series

Regel van Dries (RV3S)

- Proper Dutch speech
- Less speechless clips
- Similar to script
- >10000 clips

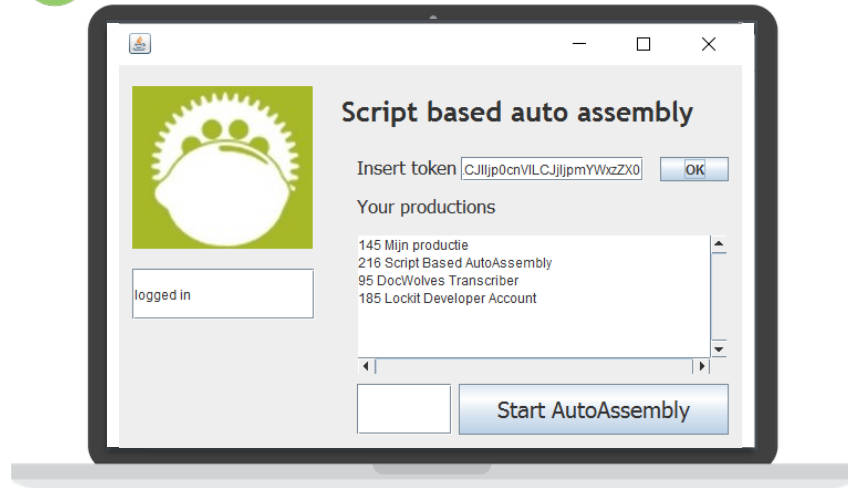
Results

- >80% linked



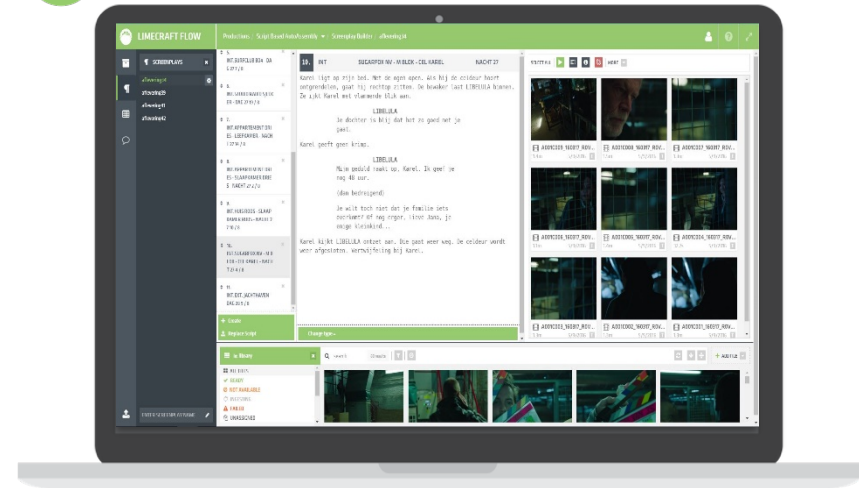
003. Use Cases

1



Choose production

2



Get sorted clips

Run NLP
algorithm

Results

- Overall 70% of the shots are linked
- Better Speech Quality -> better Recognition
- No false positives
- Significant decrease of search time

(1) 33% reduction of post production capacity

Due to

- Dailies available on set
- Audio synchronization on set
- Auto assembly
- Post-production gets a head start
- Better overall communication

*“Communication with producer, camera, light and script is a **big added value**. I edit more on the set, approximately the same volume as during an entire day at the VRT” (Jan Bockaert, Editor)*

(2) Quality improvement

There is an immediate control of the quality of the content.

- Editor on set
- Every one is involved
- The earlier detected, the lower the impact of the remedy

*“You have **total** control about the material. You edit the day after shooting, so you can detect any error immediately and fix it” (Kris Peeters, Producer)*

*“The **combination DIT and film editor** is logic. It was a refreshing experience to transfer material directly from the camera into the editing software, without passing several servers and transcoders.” (Jan Bockaert, Editor)*

(3) More robust more secure logistics

Raw Material is extremely valuable (>€25K/day).

The earlier the material is securely backed up, the less it needs to be covered by insurance companies.

“We were able to back up the material the same day of the shoot. Without the Limecraft system, it would have taken several days before the material could be backed up” (Kris Peeters, Producer)

004. Conclusions

Limecraft

- Cloud-based : Secure Online Sharing
- Seamlessly integrates with pre-existing application landscape
- Enables you to find the needle in the haystack

Key Features

- Automatic Transcription and Logging maximises exposure of your assets
- Semantic Fingerprinting enables Auto-assembly, reducing post production capacity by 33%
- Better accessibility to content improves the quality of the product

About Limecraft

- About Limecraft Flow (<http://www.limecraft.com>)
- To stay updated, like us on Facebook (<http://facebook.com/Limecraft.Connected>)
- Or just give it a try (<https://platform.limecraft.com/#auth/signup>)