# Automatic Mobile Video Director

Alexander Egurnov
University of Mannheim
aegurnov@mail.uni-mannheim.de

Thilo Weigold
University of Mannheim
tweigold@mail.uni-mannheim.de

Jon Pettersen
University of Oslo
jonup@student.matnat.uio.no

Alf-André Walla
University of Oslo
alfandrw@ifi.uio.no

***Abstract*—The abstract goes here.**

## I. Introduction

In the last years the Internet has changed rapidly. Users not only retrieve information of simple websites anymore, rather they are sharing information, videos and pictures all over through networks. With the ”Web 2.0”, user-generated content has become an important part of the Internet we know nowadays. Well-known platforms like, YouTube, Facebook and Twitter make it easy for regular people to distribute data and media.

With the changing role of mobile phones from simple communication devices to devices with a multiplicity of functionalities, user-generated content has even seen a faster growth in recent years. Due to more precise sensors, integrated high-resolution cameras and of course faster mobile network technologies, it has never been so simple to contribute content when ever and where ever you want. This fact leads to complete new opportunities for web services using data and user information, in order to create dynamic content.

Let us imagine an interesting, public event like a political speech, concert or any kind of sport event, which is not filmed and streamed professionally by TV channels. Fortunately it has become common of spectators nowadays to capture parts of ongoing events by their phone camera. The potentials are tremendous. Why not using these user-generated media to provide a real-time stream or list of videos of the ongoing event, which not present people could therefore follow anyhow. A high quality mash up of an event requires an complex selection of all potential videos available, in order to cover the whole event with the best quality provided and being aware of bandwidth constraints of the mobile network.

In the following paper we want to deal with this kind of situations and introduce our implemented approach of an Automatic Mobile Video Director. Thereby we focus on the interaction between multi clients and one central server, our automatic video director, while addressing bandwidth and complexity problems, already mentioned above. Furthermore we do not focus on retrieving sensor information, which is done only in a rudimentary and simple way.

## II. Related work

As mentioned above the interest of the public to capture and share videos from public events has increased with the introduction of mobile devices with high resolution cameras and wireless internet connection. As such there has also been a huge increase in the number of research projects trying to make this task easier and to reduce the strain represented by the uploading of such videos. (The Mobile Vision Mixer) proposes a manual way of making these videos where five people are able to set up a connection between their mobile devices, assign roles to each device, one is assigned the role of director and the others are cameramen, and capture an event taking place where they are. Others (On Demand Retrieval of CrowdSourced Mobile Video), ( Automatic Mashup Generation) uses an algorithm to make the director automatic. With this solution you have to find a way of deciding which of the videos received, is the one covering the event in the best way and with the best picture quality. They propose using metadata from the devices sensors to evaluate the quality of the videos instead of uploading all videos from an event to the server and going through the video frame by frame. This also enables us to just send the best videos to the server, discarding the rest which saves a lot of bandwidth. This is pointed out by (On Demand Retrieval of CrowdSourced Mobile Video) as a serious concern at big events like the SuperBowl.

Another area that has been investigated is the task of identifying what is called region of interest or point of interest. These terms describe areas of the event that are more interesting than others. We probably will find a video of a concert more interesting if the camera is pointing towards the stage than one pointing somewhere else. Several solutions have been proposed for solving this problem. You can go through frames of the video to see if they resemble the main attraction of the event, like a stage on a concert, or the singer on that stage. This is used in (). However the reliance on the sensors in the mobile devices for discovering such regions seems to be a much more preferred method. (Sensor-based Analysis of User Generated Video for Multi-camera Video Remixing) uses the built-in compass found on mobile devices to make sure the camera is pointing in the right direction. This system also uses the compass to detect if the camera changes direction. They make the assumption that if the camera is suddenly turned to face a different way, the user has probable spotted something interesting. Detecting this change in direction allows for a more interesting viewing experience. The detection of something interesting also goes as far as detecting which activity is being filmed. This is used to relive the managers of such systems from the trouble of marking each video with appropriate tags. (Sport Type Classification of Mobile Videos) has created a system that is able to detect which of several sports is being filmed while (MoVi) is able to detect when a social happen is taking place in from of it and start recording whenever it detects one. (MoVi) analyses sound to detect, among other things, laughter.

## III. Methodology

### A. System Overview

In this section we briefly want to give an overview of our system throughout. Detailed discussions of our implementation will follow in the subsections afterwards. To implement our idea of an Automatic Mobile Video Director it was necessary to find the right structural organization for our system. Restricted requirements and the logical distribution of tasks leads us to the decision to realize our service in an conventional client-server architecture. Figure 1 shows our system architecture, consisting of multiple clients and one central server part. This architectural set up entails some important advantages. Client-Server gives us the possibility to strictly separated tasks and work between clients and server. Compared to other possible architectures, like peer to peer, we are able to centralize all resources and important computation in one place now. Resources, like battery and computation power can be saved on client side, while the hard work has to be taken on server side. In peer to peer networks clients would have to communicate with each others, which would produce big communication overhead to weight of important resources. However these resources are reserved and needed for recording videos and sending them, if necessary to our central Video Director. Therefore we think an client-server architecture fits best the requirements of the Automatic Mobile Video Director.

### B. Client application

BRAINSTORMING: archtitecture? android sdk, camera, mediamanager, sensor, http client, service class, sqlite.

CLient tasks, architecture, android sdk

### C. Server application

Server general description goes here. Video storage, database connection, server framework description. RESTful Web Service

### D. Client-server interaction

BRAINSTROMING: HTTP protocol,

*1) Protocols:* Our Automatic Mobile Video Director server implementation provides a general interface to applications which wish to interact with it. It is implemented through HTTP requests to certain server locations result.

GET /events
: Lists all events (including videos) in JSON.

GET /event/*id*
: Returns Event (including videos) in JSON.

POST /event/new
: Create new event from JSON. Expects request body to be a JSON string containing attribute *name*.

POST /event/*id*
: Upload JSON metadata about a video for Event with given *id*.

PUT /video/*video_id*
: Upload video *video_id* from Event *id*. Expects request body to be a file stream containing a full video file.

GET /video/*video_id*
: Retrieve video *video_id* from Event *id*.

GET /selected
: Retrieve a list of selected but not yet uploaded videos in JSON.

### E. Metadata format

JSON vs XML arguments here As a final result we should state that metadata is transferred in JSON format.

id
: Client-side unique identification of the video.

filename
: File name in client's local file system.

timestamp
: Video creation time.

duration
: Video duration in frames.

width
: Video frame width in pixels.

height
: Video frame height in pixels.

shaking
: Amount of shaking detected by sensors.

status
: Video status. Indicates video life cycle phase.

serverId
: Server-side unique identification of the video. Needed for coordination of all clients.

## IV. Video Director Algorithm

### A. Video life cycle

### B. Selection algorithm

## V. Evaluation

How good/bad it is.

### A. Data Traffic

Thilo can test it. I will have a look to this. If someone has experience please let me know.

### B. Battry consumptio

Who wants to test it?

### C. Selection criteria

## VI. Future Work

Put down all the awesome ideas we have.

## VII. Conclusion

The conclusion goes here.

## References

TABLE I
TASK DISTRIBUTION

| Part | Task | Subtask | Responsible |
|---|---|---|---|
| Android application | Video Capture | | Thilo Weigold |
| | Sensor data collection | | Thilo Weigold |
| | Metadata class | | Thilo Weigold |
| | Http Client | Post Method | Thilo Weigold |
| | | Cookies, Callbacks | Alexander Egurnov |
| | | Get & Update methods | Alexander Egurnov |
| | Background upload service | | Thilo Weigold |
| | SQLite database connection | | Thilo Weigold |
| | Preferences | | Alexander Egurnov |
| | GUI | | Thilo Weigold, Alexander Egurnov |
| | Client-server data exchange | | Alexander Egurnov |
| Server application | RESTful Server application | Client authorization | Alf-André Walla |
| | | Request processing | Alf-André Walla |
| | | Video and Event logic | Alf-André Walla |
| | MySQL database connection | | Jon Pettersen |
| | Video Director | | Alf-André Walla |
| | Client-server data exchange debug | | Alexander Egurnov |
| | Video upload | | Alf-André Walla, Alexander Egurnov |
| Web Server | MySQL Administration | | Alexander Egurnov |
| | Nginx setup for streaming video | | Alexander Egurnov |
| Documentation | Basic template formatting | | Alexander Egurnov |
| | Introduction | | Thilo Weigold |