CPR Measurement and Feedback by Smartphone Camera

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Disclosure Information

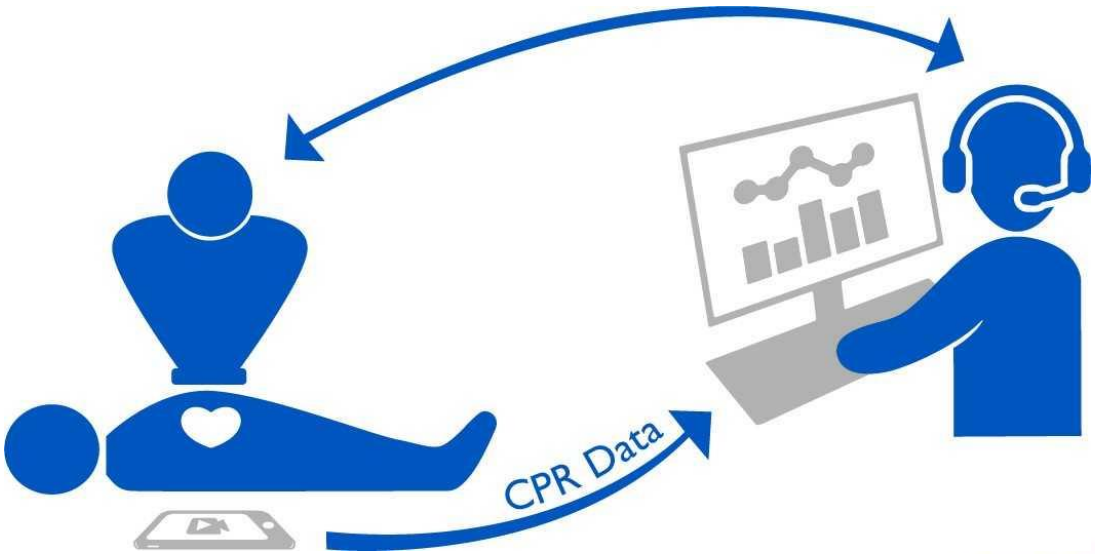
Øyvind Meinich-Bache (presenter) and Kjersti Engan are employees of the University of Stavanger and Tonje Søraas Birkenes and Helge Myklebust are employees of Laerdal Medical.

FINANCIAL DISCLOSURE:

- Laerdal Medical and the University of Stavanger has financed this study.

CPR Measurement and Feedback by Smartphone Camera

1. Establish telephone connection with the emergency unit
2. Measure the CPR quality
3. Provide real-time feedback to bystander and dispatcher
4. Estimate CPR summary parameters



Motivation

- Good quality CPR save lives
- Telephone assisted CPR and objective feedback improves CPR quality

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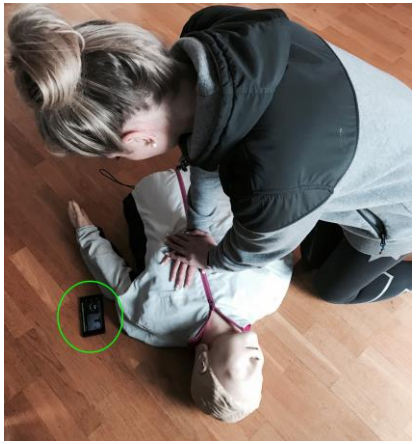
CPR measurement devices

Others:

Require the device to be placed on the patient`s chest or strapped to bystander`s arm



Us:

Using the camera allows the smarthpone to be placed flat on ground

→ more suited for real emergencies

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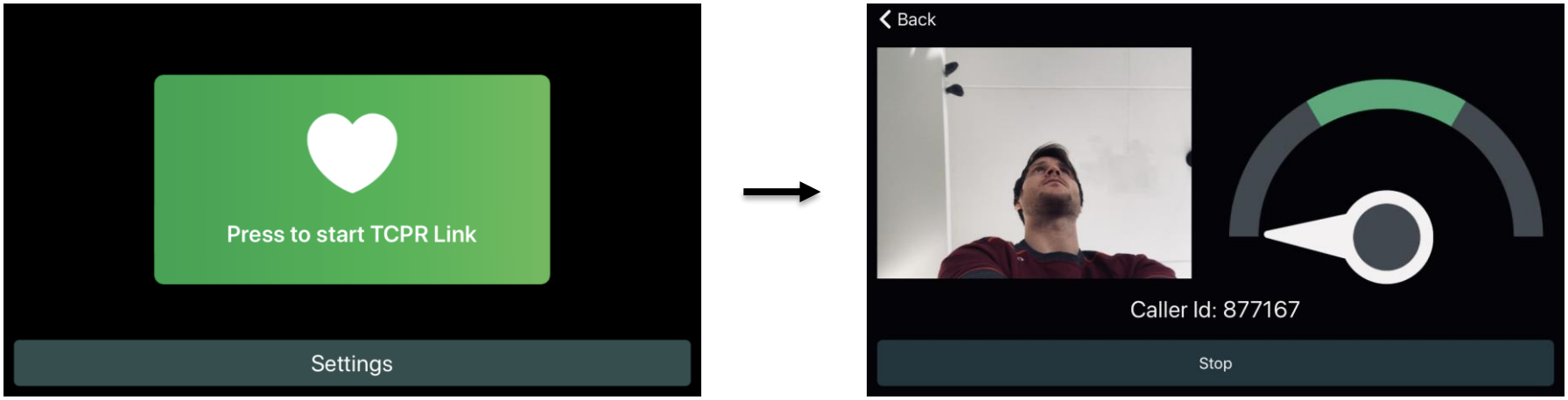
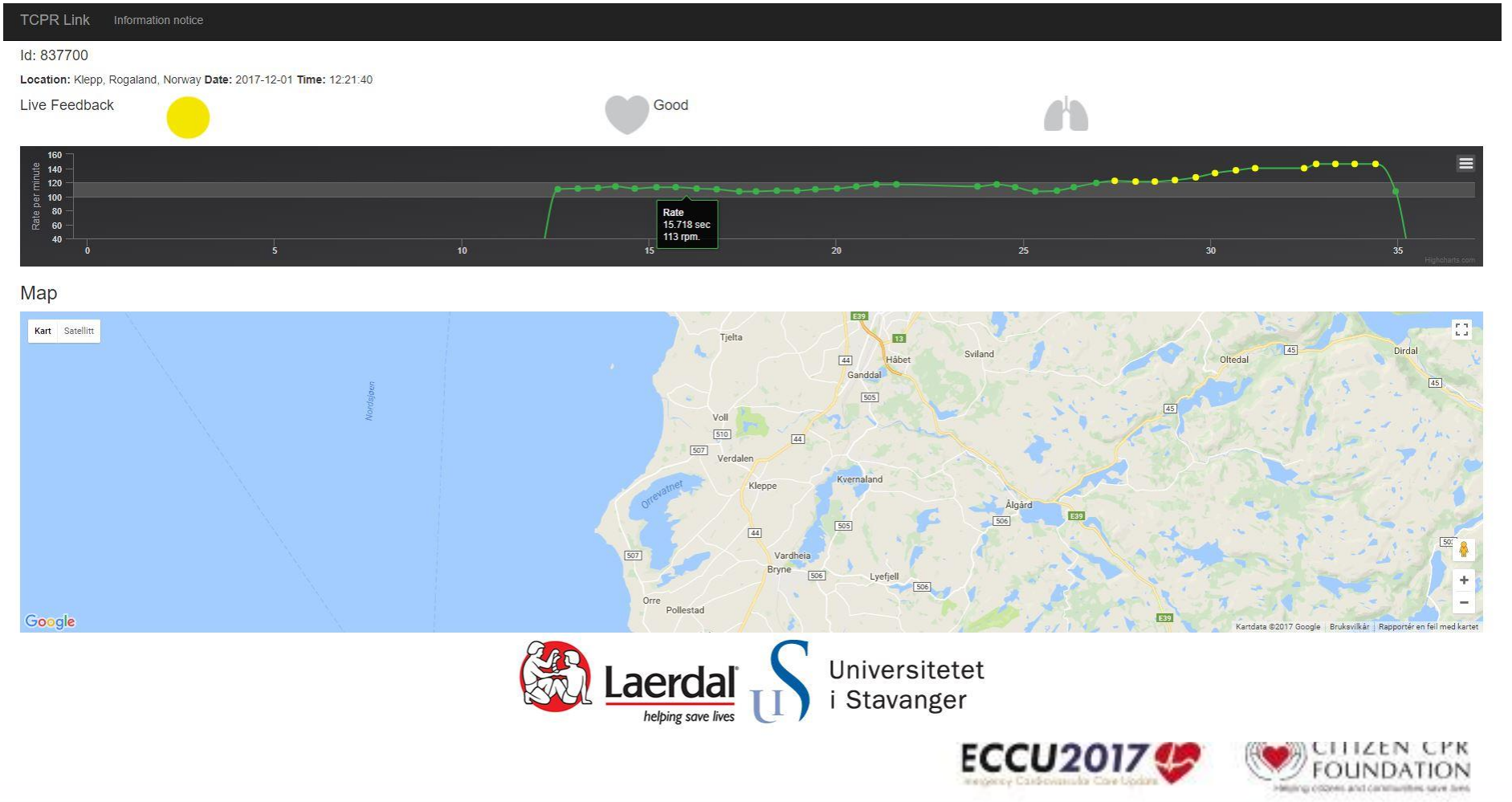
TCPR Link video:

https://www.youtube.com/watch?v=EB_Xn3JWXgE

Smartphone application



Webserver



Laerdal helping save lives

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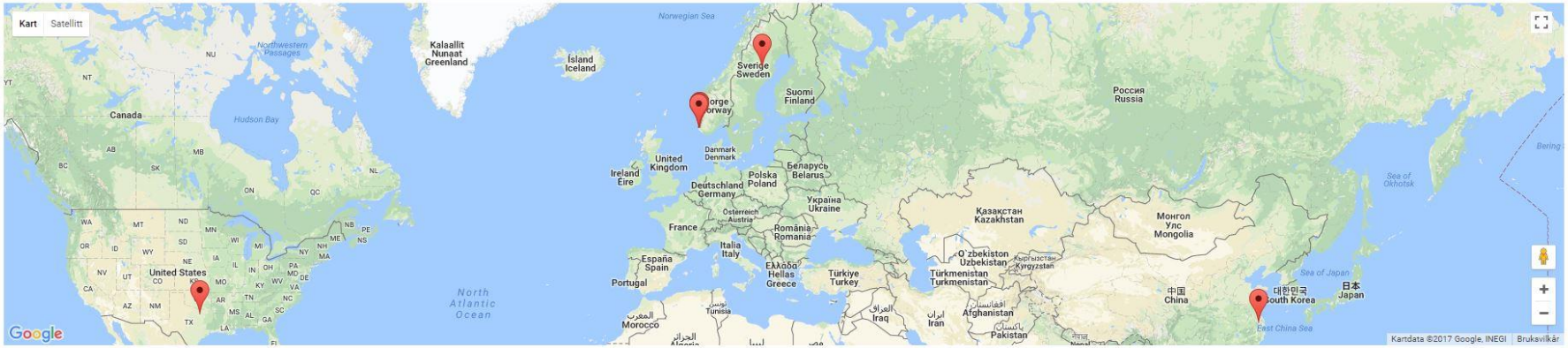
Webserver

TCPR Link Information notice



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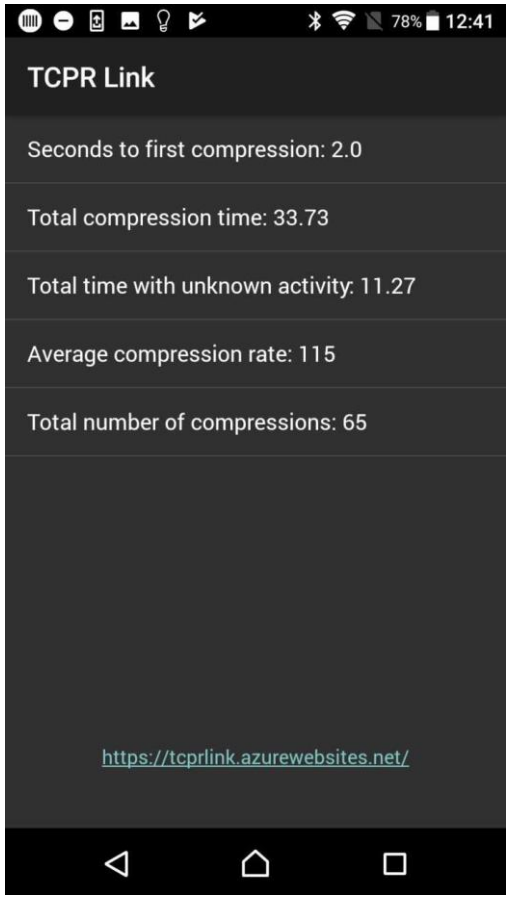
Method [1]

1. Meinich-Bache Ø, Engan K, Birkenes TS, Myklebust H. Robust real-time chest compression rate detection from smartphone video.

CPR summary report

1. Time to first compression
2. Total compression time
3. Time without compressions
4. Average compression rate
5. Total number of compressions



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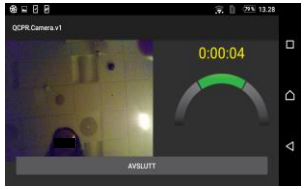
Test Validity (9 tests)

1) Different hair lengths, short, med., long

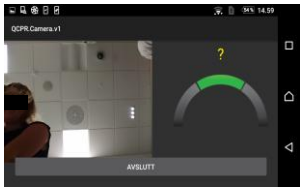
2) 60, 100, 120 and 150 cpm
3) Low lighting



4) 30:2 sessions
5) Outdoor

6) Disturbance

7) Smartphone positions



8) Random movement
9) CPR summary parameter test

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Results

Mean Error, ME, - (|detection-reference|)

Hair lengths (short, med., long) and compression rates (60,100,120 an 150) :	ME = **1.3** cpm	(n=7)
Low light:	ME = **1.1** cpm	(n=7)
Disturbance test:	ME = **1.8** cpm	(n=7)
Outdoor test:	ME = **1.4** cpm	(n=3)
30:2 sessions:	ME = **3.9** cpm	(n=7)
Phone position far away:	ME = **7.2** cpm	(n=7)

Results

Performance, P (amount of time without false detections)

Random movement test	P = **89.6** %	(n=3)

Relative Error, RE $\left(\frac{Detection-Reference}{Reference}\right)$

CPR summary parameters:

Time to first compression	RE = **6.1** %	(n=5)
Total compression time	RE = **2.8** %	(n=5)
Time without compressions	RE = **10.0** %	(n=5)
Average compression rate	RE = **1.8** %	(n=5)
Total number of compressions	RE = **1.6** %	(n=5)

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Discussion and Conclusion

- Good detection results under the conditions tested

- Both the bystander`s head and shoulders should be included in the image frame

- Future work:
  - The application should be tested in simulated emergencies
  - Investigate the system`s effect on the CPR quality

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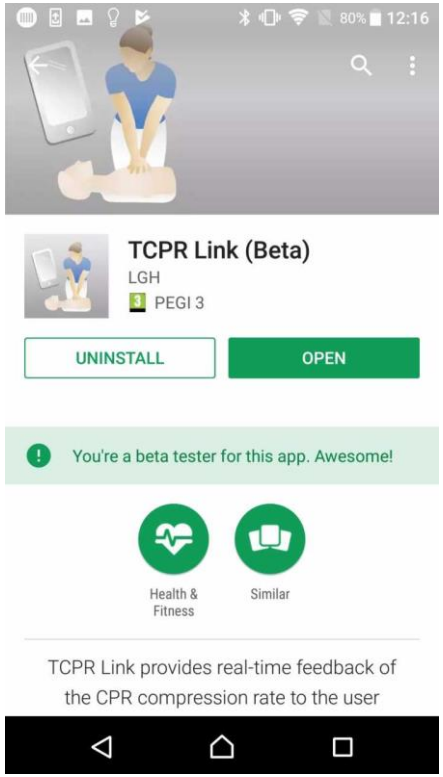
TCPR link

Google Play



App Store

TCPR Link workshop:

https://www.youtube.com/watch?v=jD9y7gOEIpY

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University of Stavanger

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- **Thank you for your time!**

- **Questions?**

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