

TEST 1

Friday, July 15, 2022 4:18 PM

QUESTION 1

Briefly explain an OFDM technology?

(OFDM) is a method of digital data modulation, whereby a single stream of data is divided into several separate sub-streams for transmission via multiple channels.

From <<https://www.tutorialspoint.com/orthogonal-frequency-division-multiplexing-ofdm>>

Uses large number of carriers each carrying raw bit data

Advantages

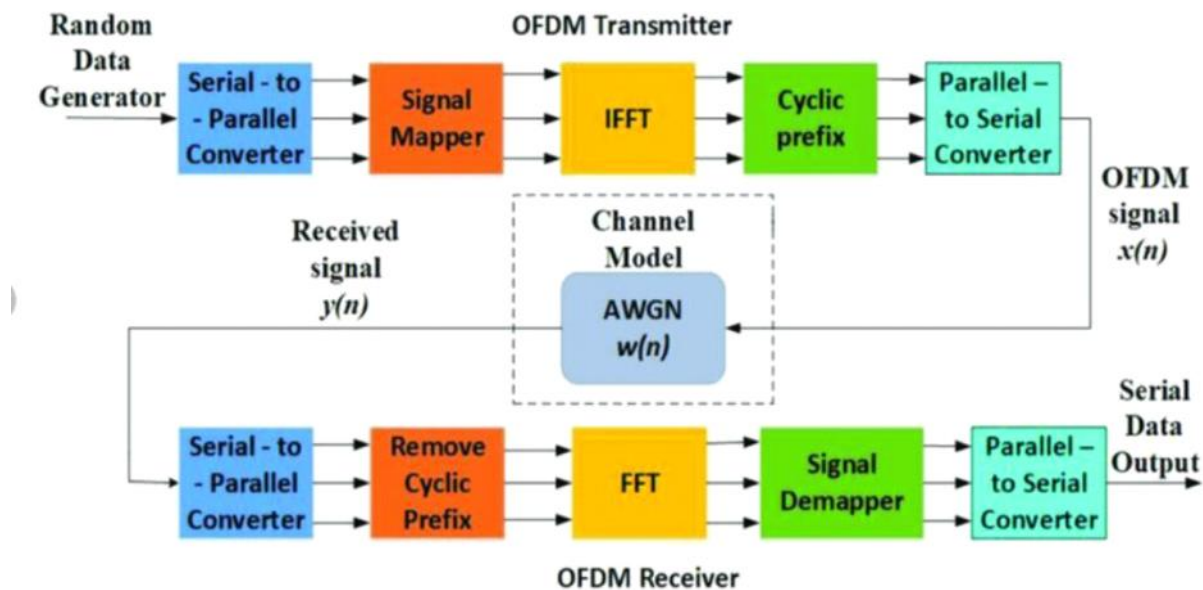
- Very resilient to selective fading, interference and multipath effect
- High degree of spectral efficiency
- Allows for multiple subscribers to increase

If you have the same frequency, different timeslots will be changed and in same slot there will be different frequencies and in all situations there are different codes.

Usages

- In Wi-Fi
- DSL internet access
- 4G wireless communication and 5G
- Digital television
- Radio broadcast services
- WIMAX
- Under water communications
- Power line network

3 important stages of obtaining OFDM signal



Serial parallel conversion
Signal mapper
IFFT???

5 technologies that use OFDM in its signal transmission and perception

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Why OFDM is preferred in 4G downlink rather than uplink

To overcome the effect of multipath fading (reduction of signal strength at the receiver) problem

It has large bandwidth (amount of data transfer per time)

Has multiuser capacity

High data rate (transmission speed)

It is not used in uplink because it has a high peak to average power ratio

Differentiate 4G uplink and downlink

<https://www.electronicdesign.com/technologies/4g/article/21796272/an-introduction-to-lteadvanced-the-real-4g>

| Uplink | downlink |
|---|---|
| Link from one ground station or receiver up to a cell tower (signal leaving your phone to the cell tower) | Link from a cell tower down to one or more ground station or receiver (signal coming to your phone from the cell tower) |
| Uses SC-FDMA | Uses OFDM |
| | |

QUESTION 2

Explain handover and the different handover schemes

Handover - being assigned to another frequency when you are away from your cell to ensure uninterrupted calls and maintain seamless connectivity

Types

- Hard : terminate before making the connection (break before you make)
- Soft : make before you break

Types

- Intra-cell handover
- Inter cell - Intra BSC handover
- Inter BSC - Intra MSC handover
- Inter MSC

Handover employed in 2g vs 3g

[Generations] - check (<https://www.ijsr.net/archive/v5i6/NOV164308.pdf>)

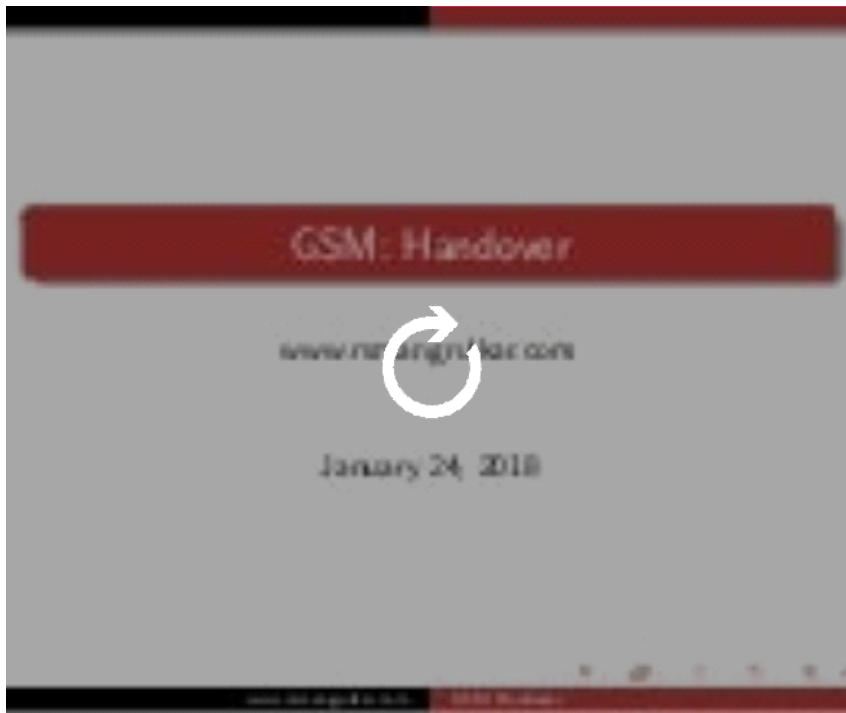
1G - analog voice, circuit switched technology, FDMA - network controlled Handover (check Japhet's pdf)

2G - used mobile assisted technology for the handoff where the mobile phone measures the signal strength to the base station - discuss the 4 types (check Jacinta's doc)

- Intra-cell handover (Intra-BSC)
- Inter cell (Intra BSC) - Intra BSC handover
- Inter BSC - Intra MSC handover
- Inter MSC

3G - Soft handover (check Japhet's pdf)

[GSM: Handovers](#)



5G will have seamless connectivity. Explain

Higher bandwidth and lower latency (less than one millisecond)

Promises 100 times delivery compared to 4G

5G is the fifth generation of cellular technology with high speed, low latency, ..

Read more at:

<https://telecom.economictimes.indiatimes.com/tele-talk/5g-deployment-seamless-connectivity-for-a-future-ready-economy/4490>

From <<https://telecom.economictimes.indiatimes.com/tele-talk/5g-deployment-seamless-connectivity-for-a-future-ready-economy/4490>>

What makes 5G faster? <https://www.thalesgroup.com/en/markets/digital-identity-and-security/mobile/inspired/5G>

The shorter the distance the larger the bandwidth - it uses millimeter waves which have shorter frequencies

Camera Handover criteria - to optimize coverage of security systems

Handoff or handover is transferring control of a mobile object from FOV of one camera to FOV of another camera.

From <https://link.springer.com/chapter/10.1007/978-981-33-4862-2_29>

The presence of feature location within the handoff boundary indicates the need for handoff, either giving or accepting. The features found in the handoff boundaries of adjacent cameras are compared. If the features match, handoff will be initiated.

From <https://link.springer.com/chapter/10.1007/978-981-33-4862-2_29>

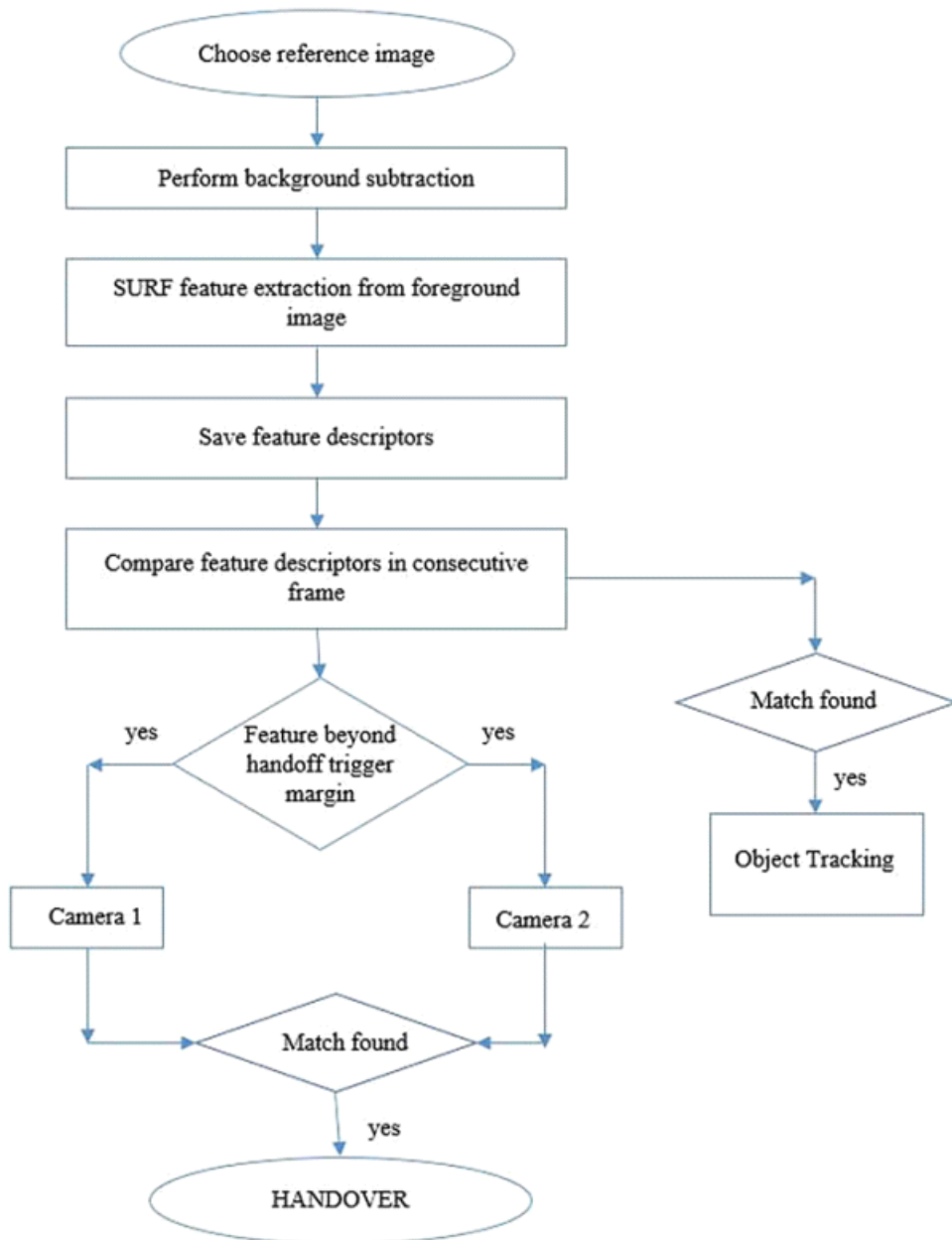


Fig. 2 Algorithm for Camera Handoff and Object Tracking

When setting up you specify the IP for each camera with the range that it can take

SURF algorithm helps in tracking to know where the boundary from which it is reached then the other camera can take over

1. We need to do background subtraction to get resultant foreground image
2. Foreground image is needed to be processed by SURF algorithm
3. Surf algorithm does tracking to identify the boundary
4. The boundary helps to know whether we can initiate the handoff