Week 1

Meeting: discussed the project timeline

obtained the 'noise & signal' and corresponding simulation tutorial

Outcome. revised MATLAB operations

built Q-function with predefined function 'erfc'

plotted analytical BER vs Eb/No for unipolar NRZ

forked it to bipolar NRZ and compared the result

problem: changed the design of Q-func rather than the main function (found and corrected in wk 2)

Week 2

Meeting: Q-func problem pointed out

discussed the physical meaning of Q-func (error probability)

obtained materials about fading and optimum receiver

Outcome: corrected the Q-func

learned fading channel model: Rayleigh Fading (distribution. signal detection. BER and MATLAB implementation)

compared AWGN channel & Rayleigh channels in terms of BER vs. E_b/N_0

Problem: understanding the threshold

$$V_T = \frac{E_0 + E_1}{2} \quad \text{or} \quad \left|\frac{E_1 - E_0}{2}\right| \ ?$$

thought to be the previous one.

Wk 3:

Meeting: explained my understanding to form-I receiver

discussed requirements, keypoints and must-haves of the preliminary report

got the slides of signal space.

Outcome: finished the abstract and introduction parts

generated the multi-path fading channel (Rayleigh fading IR + FFT)

Problem: why 6×6 gain became 64×6 after 64-point FFT? what's the physical meaning? What does 64 stand for?

Week 4:

Meeting: discussed the problems about the threshold: should be the difference. (same idea but we don't consider the actual base value)

got MATLAB tutorial set

Outcome: understood the optimum receiver form-I (map/cast to basic signal sets and compare)

simulated the NRZ & RZ BER vs Eb/No with Monte-Carlo method. Compared with the theoretical value.

skimmed through MATLAB 1-6

problem: cannot understand form-II receiver

Week 5

Meeting: discussed the form-II receiver:
need to know signal space first

asked the question about FFT:
FFT point = number of points
in frequency = number of subcarriers

got all the remaining slides of
wireless comm.

Outcome: debugged the design of Rayleigh
fading channel (h's generated independently
for different channels)
planned the timeline and corresponding
cornerstones

designed the Gantt Chart for the
project

Problem: need to know signal space

Week 6

Meeting: showed the results of the Rayleigh fading channel: problem about the scale pointed out (the total power of all paths should be normalised to 1)

Outcome: fixed the problem above by multiplying the IR by scaling factor

studied the signal space

Problem: how to determine basis signals?

in Cardinal coordinate, 2 points → 1-D. 3 points → 2-D ..., why in signal space we can have 2 points → 2-D?

why the energy of basis signal is 1 rather than the length?

Week 7

Meeting: determining basis signals: mapping or GSO procedure

signal space: predefined for easy signal implementation

energy rather than length: we want reflect the difference of energy.

Outcome: Understood OFDMA and its' pros & cons compared with FDMA. TDMA and CDMA (b/w efficiency)
Memorised the structure of OFDM transmitter and receiver

Problem: How has the original msg been changed during process?

What's the difference between ISI. IBI and ICI?

why for CP we need to repeat the info to make blocks orthogonal? what if we leave it blank?

Week 8

Meeting: original dealt with for subcarriers to convey.

CP: avoid IBI. if left blank, the two adjacent block won't be orthogonal.

Outcome: maximum capacity subcarrier allocation (For each sc., compare the corresponding gain for every user and assign it to the one with maximum gain. Finally remove it from the available sc. set).

Problem: now the number of sc. = user. generally it should > user. the algorithm should be improved later.

some user cannot get sc. in a certain slot with MC allocation. Is this right? If not, how to ensure MC and allocate those users with scs?

Week 9:

Meeting: N_sc > N_user, but just assume they equal now.

There are some users without scs in a certain slot, to reach MC.

Outcome: Simulated the avg. data rates for channels for MC & random subcarrier allocation.

began to design water-filling algorithm.

Problem: —

Week 10

Meeting: asked the idea and design of WF.

not fully understood the iteration and suggested to read relevant reference.

Outcome: designed a demo of WF power allo-cation scheme but the result is not as anticipated: the overall channel power is not 1.

read through the reference but cannot get the point.

Problem: the channel power is not 1 as ex-pected.

Still not understand the steps of WF algorithm.

Week 11

Meeting: the SCs with neg. power need to be removed from the available set and the SC. number should be updated after one cycle of channel.

The result should be iterated and calculate again if there are un-available SCs.

Keep repeating the steps above until all available SCs are allocated with power ≥ 0.

Outcome: fixed the WF algorithm. ($\Sigma P = 1$ ✓)

Compared the data rate with equal power allocation ($P_{sc} = \frac{1}{N\_sc}$)

Combined the subcarrier allocation schemes (random / MC) with power allocation schemes (equal / WF), reflect the result by channel data rate designed the slides and prepared for the project presentation

Problem: —

Week 12

Meeting: no meeting (presentation)

Outcome: delivered a presentation about the project intention, possible outcome, applications and progress so far

Problem: what's the case in real-world?

whether the ISPs have similar schemes?

Week 13

Meeting: explained the progress so far and discussed the following plans.

Outcome: learned the information about the structure of MAC layer: packet size, slot, packet arriving interval, QoS, etc.

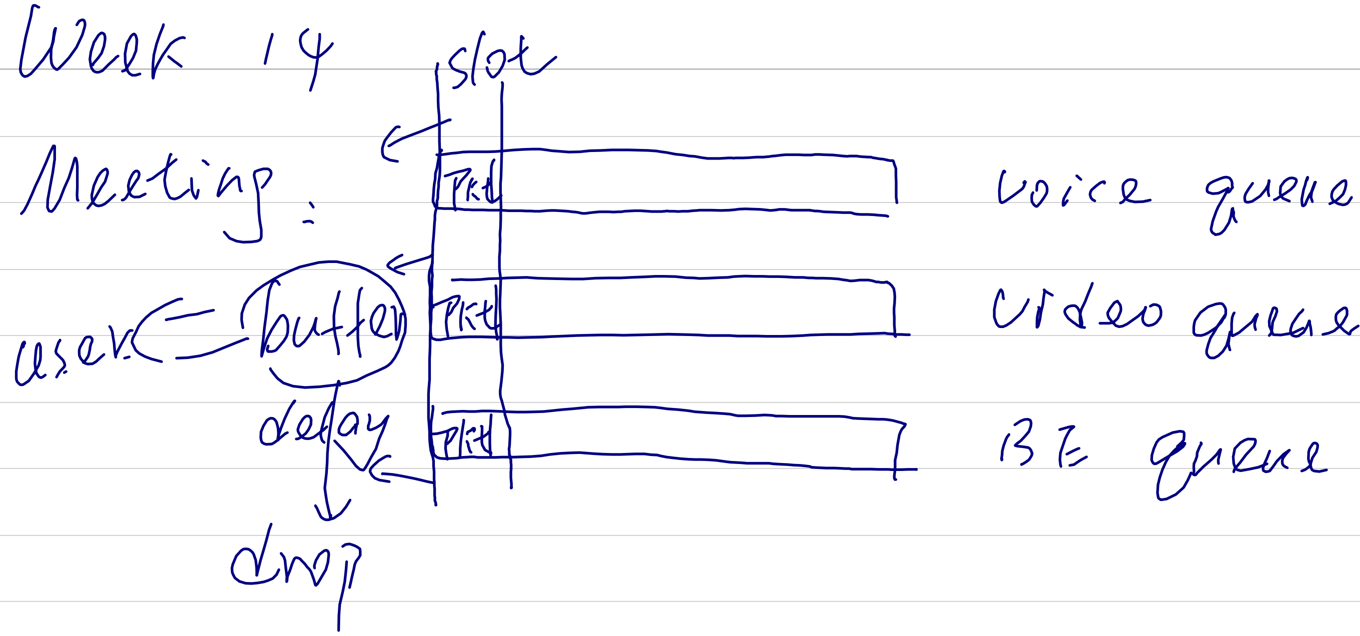
read the reference and understood the ideas of M-LWDF & PD: queue based and packet based

Problem: relationships between queues and packets?

how can slots be linked to packets and queues?

Week 14

Meeting:



Outcome: finished the weight design func. for M-LWDF

began to design weight on packet based, with size. delay. QoS, etc.

Problem: have no idea about the real delay calculation

Week 15

Meeting: Delay is already derived in pkt weight design. so don't need to consider it again.

Outcome: Fixed the M-LWDF weight design (use updated raw data to calculate the queue weight)

designed the demo for PD scheduling

Problem: PD: delay obtained when designing packet weight.

M-LWDF: how to determine delay?

Week 16

Meeting: showed the weight design of 2 scheduling schemes.

M-LWDF: calculate the time duration that a packet in buffer.

Outcome: improved the PD weight design (fixed the logic problem of the sequence of checking packet number. allocate weight & update data)

Problem: if we use the method for M-LWDF to calculate delay for PD. we got 2 different schemes to calculate delay. will they be the same?

WK 17:

No meeting (Judy away)

Outcome: combined the weight design of M-LWDF & PD with SC & power allocation (MC. WF), then obtained MWC & CWF algorithm.

Created main functions, demo called the resource allocation func in every slot, which uses the result of weight design functions.

main → RA $\underset{\text{weight delay}}{\overset{\text{data pkt info}}{\rightleftarrows}}$ DS

Problem: Previous work considered weights only for [100 75 50] pkts for voice, video & BE. But the delay tolerance is [100 400 1000]. Does it mean for BE pkt with delay = 500, we don't calculate its weight?

Wk 18:

No meetings (Judy away)

Outcome: fixed the problems by setting weight pkt number = tolerance.

simulated the avg. voice. video delay and system throughput based on different schemes.

designed the poster and prepared for the inspection.

Problem: ~