Part 2 Coursework EE401: Advanced Communication Theory

"Multipath Space-Time CDMA"

General Information

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Language used in this coursework: C++

How To Compile The Programs

Compile the source files on a UNIX-system by running the following commands in the extracted project root directory:

- $ mkdir build
- $ mv task*.sh build
- $ cd build
- $ cmake ..
- $ make

The executables and additional scripts are now located in the newly created build directory.

How To Run The Programs

The programs must be run from the command-line interface. For the tasks 1, 2 and 3, the arguments should be provided in the following format:

- $ ./task? [SNR] [output-path] [source-path] [spam1-path] [spam2-path]

For example:

- $ ./task1 20.0 out.raw image.raw interference1.raw interference2.raw

The program of task 4 takes only one argument, which is the output-path. It will look like

- $ ./task4 out.txt

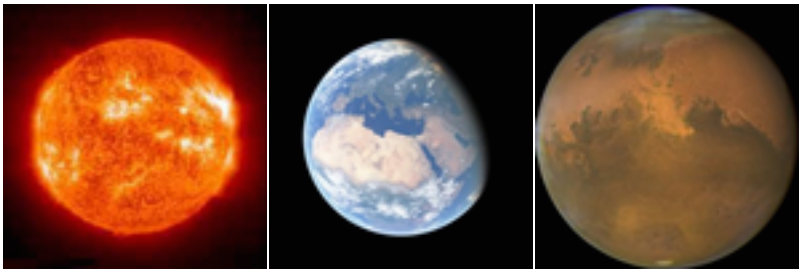
Of course, all the paths of the inputs must point to existing files. **However, for each task a shell script has been provided, which executes the necessary programs (including extraction of pure RGB-data etc.).** To do all the computation for task 1, for instance, just call

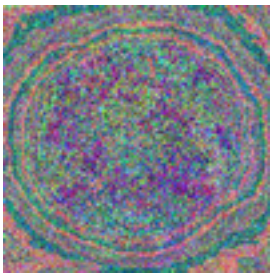
- $ ./task1.sh

Please consider that the execution of the scripts might take several minutes. After execution, the results can be found in newly created directories ("task1_results", …).

Task 1, Results

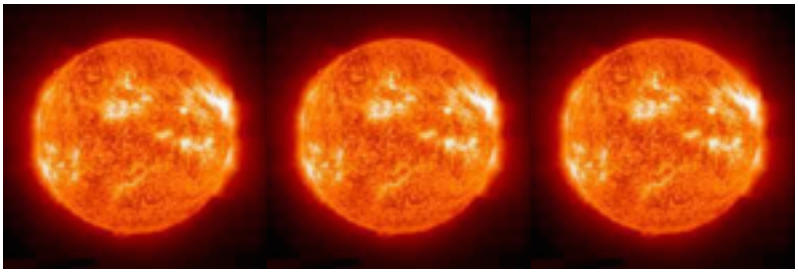
From the three images below, the desired one is the left one, whereas the other two are transmitted by interfering users.





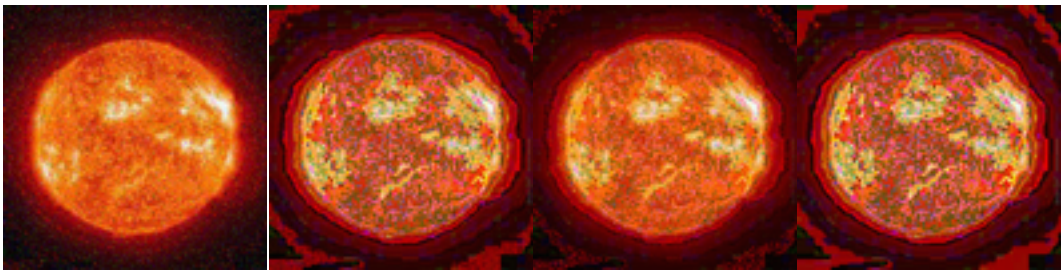
The Image (left) received at an SNR of 0.0 dB is clearly distorted.

The images received at 10.0 dB, 20.0 dB and 40.0 dB respectively, shown below, have been successfully reconstructed and contain no errors. This was predictable due to the high SNRs.



Task 2, Results

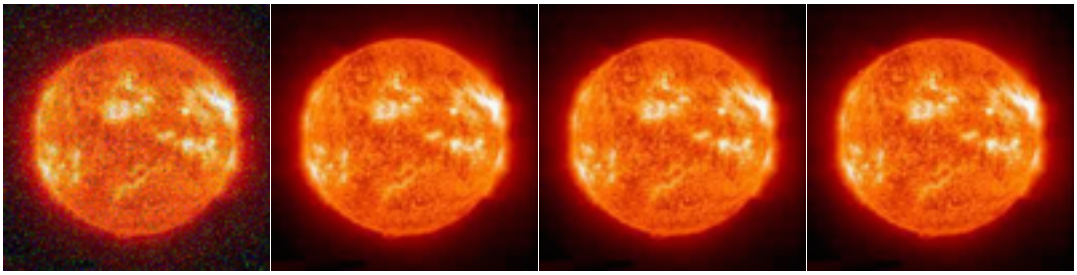
The transmitted images are the same as in task 1. The results, however, are conflicting with expectations. The best reconstruction could be done at an SNR of 0.0 dB, while the others are more strongly distorted. The results at the different SNRs (0.0 dB, 10.0 dB, 20.0 dB and 40 dB, ascendig order) are shown below.



I could not find an explanation for this.

Task 3, Results

Again, the transmitted images are the same as in task one. This time the results make sense, as in task 1. The image transmitted at the lowest SNR contains a few errors, while the others could be perfectly reconstructed. All received images are shown in ascending order with respect to the SNR.



Task 4, Results

After entering the parameters given in the personal file and then despreading with the given gold sequence, I could not reconstruct a text message from the received signal. There are several explanations that could be the reason for this:

- I computed the wrong gold sequence.
- I make a programming mistake somewhere.
- I misinterpreted the specifications.

Given the fact that I can not determine, after which step(s) the mistake happened (because I don't know the original message), I can not find out, which of the explanations apply to this problem.