

EE482 Communication Systems II

Lab Assignment - I[†]

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[†]Please check the due-date in the course homepage.

This is our first lab assignment; I believe you will be ready to work on meaningful Lab. assignments based on MATLAB coding in a week or two. Let us do our best to improve ourselves. Please intentionally try allocating your time slots including Lab classes to training MATLAB skills for your near future.

As Fig. 1 shows, the base station has two different information to be sent: “0” and “1” where the time-domain signals, $S_1(t)$ and $S_2(t)$ correspond to the information 0 and 1, respectively, in Fig. 1-(a). Further, the associated basis functions are also illustrated in Fig. 1-(b)

(1) **[Decision Boundary & Decision Region]** Generate a large number of samples to be received at the user equipment (UE) or, equivalently mobile station (MS); and apply decision rule that we have learned in the class, i.e., likelihood-ratio based decision rule. Depending on the decision of whether 0 or 1, plot all the generated and decided samples at One figure such as Fig. 1. Repeat the aforementioned process for five different scenarios in terms of signal-to-noise ratios, SNR = -3, 0, 3, 6, 15 dB.

(2) **[Probability Density Function (pdf) of the generated samples]** Plot the distributions of the random variables, r_1 and r_2 , which are projections of samples in (1) onto basis functions $\phi_1(t)$ and $\phi_1(t)$, respectively. Repeat the process for two different scenarios, SNR = 0 dB and SNR = 15 dB.

(3) **[Discussions]** Provide the analysis for the given results in (1) and (2). Describe interesting symptoms, in particular, if you meet any unexpected behavior(s). Think about the reason, and describe your reasoning.

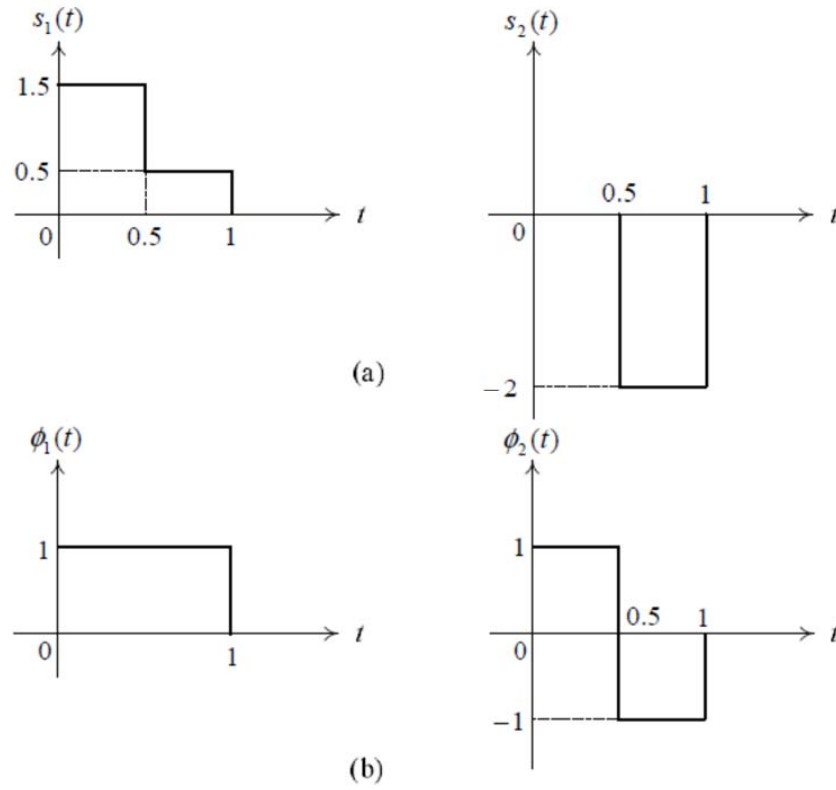


Fig. 1: Waveforms of two time-domain signals, $S_1(t)$ and $S_2(t)$; and the associated basis functions, $\phi_1(t)$ and $\phi_2(t)$