CHAPTER 9

CONCLUSION AND FUTURE WORK

9.1 CONCLUSION

In the present research, generation of modified WH code sets based on kronecker product recursion using different basic kernels is proposed. The basic kernels are chosen from CSS, Bent sequences and by applying code concatenation and permutation to the existing WH codes. As part of the present research, the following WH like codes of length 16 designated as z161, z162, z163, z1, z2, z3, z4, z5, z6 and z7 have been generated based on applying code concatenation and permutation to the existing WH codes. Further B16 and F16 codes of length 16 are generated using fourth order Bent sequences and orthogonal Bent functions respectively. z9 and z27 codes of length 9 and 27 respectively are generated using CSS. Further increase in the code length and code set size can be achieved by using kronecker product recursion method. It is found through literature survey that improvement in the correlation properties of the modified WH codes is achieved by applying diagonal modification method. Four different diagonal elements namely Wysocki, Williamson, Bent1 and Bent2 chosen from the literature are applied to WH and the proposed codes and their performances are compared. On an average there is a marginal degradation in the BER performance of the proposed codes in a DS-CDMA system in an AWGN channel than the WH codes. Comparing the proposed codes, it is observed that at a SNR of 6dB and 12dB B16 and z162Bent1 offers an improved BER performance. These codes are assigned as signature codes to SU in UCR system and their BER
performance is obtained in an ordinary DS-CDMA system and an UCR system. It is observed that B16 codes offer better BER performance of the order of $10^{-4}$ than the other codes in an UCR system in an AWGN channel. Simulations showing the BER performances of these codes in an AWGN plus flat fading Rayleigh channel have also been done. It is also observed that the application of length 16 Walsh codes and the proposed codes in an UCR system in an AWGN plus flat fading Rayleigh channel results in performance degradation of the order of $10^{-2}$ when compared with its performance in a DS-CDMA system. Diagonalisation of Walsh codes using Wysoc diagonal elements offer better performance of the order of $10^{-2}$ at the PU end in an UCR system than with the other types of diagonalisation. Combination of length 16 Walsh codes and F16 codes using Wysoc diagonalisation results in a better performance at the PU end. At the SU end in an UCR system, diagonalisation of $z7$ and $z162$ using Bent1 and Bent2 diagonal elements provide better BER performance at a SNR of 6dB and 12dB respectively. $z27$ codes offer BER performance improvement in an UCR system in an AWGN channel and AWGN plus flat fading Rayleigh channel than in a DS-CDMA system.

Finally, a novel method of generating WH codes using lattice filter that can be reconfigured to function as a matched filter for multiuser detection in a DS-CDMA system is proposed. In SDR, the main aspect is to use flexible components suitable for all types of communication systems. The main significance of the proposed WH Code generation is that a new code can be generated by just changing the reflection coefficients of the lattice filter. The results of simulation showing the generation of WH codes from the AR model of first order Gauss-Markov process is also obtained. It shows that the BER performances of the conventional and matched filter method of despeading are marginally the same.
9.2 SUGGESTIONS FOR FUTURE WORK

Formation of spreading code sets that are orthogonal to each other to reduce co-channel interference in an UCR system and applications of the proposed length 16 codes in image processing is a further extension of the present research. The research can be further extended to the formation of OVSF codes from the proposed modified WH codes suitable for variable data rate transmission such as voice, data and image. A relatively flat spectrum of the proposed code shows that they can be applied in cryptography.

In general, interference and channel noise effects in wireless communication receivers are reduced by using equalisers implemented using filter structures. Since the lattice filter transfer function represents a Gauss Markov process, this lattice filter structure can be interpreted as matched with a slowly varying transmitted signal or slowly varying channels. Thus this structure can be used as a matched filter receiver or as an equaliser at the receiving end. Reconfiguring the LF to act as an equaliser for other wireless standards such as OFDM and MC-CDMA and integrating the equaliser and spreading operations in the LF structure by optimising the reflection coefficients at the receiving end in a DS-CDMA system is a further extension of the current work. It can be extended to implement the generation of the proposed codes and various spread spectrum codes such as Gold code, Kasami code and multilevel integer codes using LF.