Povzetek

V tem delu se bomo ukvarjali s konvolucijskimi kodami, ki sodijo v razred kod za odpravljanje napak pri prenosu podatkov preko digitalnih komunikacijskih kanalov. Njihova najbolj odlikovana lastnost je izjemna učinkovitost pri odpravljanju naključno porazdeljenih napak. Konvolucijske kode bomo najprej definirali v ustreznem matematičnem okolju. Nato si bomo podrobneje ogledali njihove generatorske matrike in poiskali matrične lastnosti, ki so ključne za učinkovito vpeljavo strojnih in programskih kodirnih rešitev. Zaključili bomo s predstavitvijo Viterbijevega algoritma za odkodiranje konvolucijskih kod ter z izpeljavo zgornjih meja za nastop bitnih in grozdnih napak pri odkodiranju. Dodatno bomo predstavili osnove digitalnih komunikacijskih sistemov in nekatere najbolj odmevne uporabe konvolucijskih kod v praksi.

Ključne besede: pomični register, konvolucijska koda, generatorska matrika, Viterbijev algoritem, verjetnost grozdne napake, verjetnost bitne napake

Abstract

This thesis deals with convolutional codes, a class of error-correcting codes widely used for communication over digital communication channels. Their most important property is great efficiency when removing randomly distributed errors. We will first define convolutional codes in appropriate mathematical settings. Then we will study their generator matrices and find matrix properties of great importance for efficient hardware and software implementation of codes. To make thesis complete, we will present Viterbi decoding algorithm together with upper bounds for burst and bit error probability. We will as well present basic elements of digital communication systems and some of the most famous practical uses of convolutional codes.

Key words: shift register, convolutional code, generator matrix, Viterbi algorithm, burst error probability, bit error probability

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