Some answers to student questions

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Noiseless coding

Question 1. *Does there exist an algorithm to determine if a code is uniquely decipherable?*

Answer. *Yes! It is called the Sardinas-Patterson algorithm.*[1]

[1] Wikipedia. Sardinas–Patterson algorithm — Wikipedia, the free encyclopedia. `http://en.wikipedia.org/w/index.php?title=Sardinas%E2%80%93Patterson%20algorithm&oldid=1128726851`, 2023. [Online; accessed 24-January-2023]

Question 2. *What happens when equality is achieved in Kraft-McMillan inequality? In other words, given a sequence of potential lengths oof codewords $(\ell_1, \ell_2, \ldots, \ell_m)$, in an n-ary alphabet, what can we say when*

$$\sum_{i=1}^{m} \frac{1}{n^{\ell_i}} = 1?$$

Answer. *In the case equality is achieved, the code is* exhaustive.[2] *An exhaustive code $f : W \to \Sigma^*$ is one in which any sequence of letters is either a message $f^*(w_1 w_2 \cdots w_n)$ or the prefix of a message.*[3]

[2] Mordecai J. Golin and Hyeon-Suk Na. Generalizing the Kraft-McMillan Inequality to Restricted Languages. In *Proceedings of the Data Compression Conference*, DCC '05, page 163–172, USA, 2005. IEEE Computer Society

[3] L.S. Bobrow and S.L. Hakimi. Graph theoretic prefix codes and their synchronizing properties. *Information and control*, 15(1):70–94, 1969

References

[BH69] L.S. Bobrow and S.L. Hakimi. Graph theoretic prefix codes and their synchronizing properties. *Information and control*, 15(1):70–94, 1969.

[GN05] Mordecai J. Golin and Hyeon-Suk Na. Generalizing the Kraft-McMillan Inequality to Restricted Languages. In *Proceedings of the Data Compression Conference*, DCC '05, page 163–172, USA, 2005. IEEE Computer Society.

[Wik23] Wikipedia. Sardinas–Patterson algorithm — Wikipedia, the free encyclopedia. `http://en.wikipedia.org/w/index.php?title=Sardinas%E2%80%93Patterson%20algorithm&oldid=1128726851`, 2023. [Online; accessed 24-January-2023].