1) How to compute the summation for $O(2^n)$ terms (i.e., $\sum_{S\subseteq N\{i\}}$ in Eq.)?
2) How to define a characteristic function v?

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- The energy (i.e., negative log-likelihood) of GMMs (hereafter *GMM*).
- The reconstruction error (i.e., squared distance for the real-valued datasets or cross entropy for the binary-valued) of VAEs (*VAE-r*).
- The negative ELBO of VAEs (*VAE-e*).
- The energy of deep autoencoding Gaussian mixture models [**?**] (*DAGMM*).

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- DF-TDMA: the mobile device transmits to the relays in different time slots. In this case, a convex problem is formulated with respect to offloaded data amount, allocated time slot for different relays and transmit power of the mobile device and relays. To get more insight of the problem structure and reduce computation complexity, a bilevel optimization method is utilized. In the upper level, the optimal data amount for offloading is acquired, while in the lower level, other variables are optimized. The lower level problem is convex, and transformed into a linear programming with KKT conditions. The upper level problem is as well proved to be a single variable convex problem.

  With the above methods, global optimal is obtained with lower complexity, compared with directly using traditional numerical methods.
- DF-FDMA: the mobile device transmits to the relays simultaneously in different subbands. In this case, a nonconvex problem is formulated with respect to offloaded data amount, overall transmit duration, allocated bandwidth for different relays and transmit power of the mobile device and relays. Utilizing bilevel method, in the upper level, the optimal data amount for offloading is acquired, while in the lower level, other variables are optimized. The lower level problem is convex, and transformed into a linear programming with KKT conditions. In the upper level, we form the problem into a monotonic programming, and apply Polybolck Algorithm to solve it. With the above methods, global optimal is obtained.

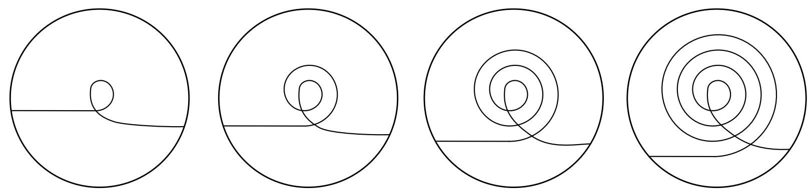

Fig. 1. The snail divides with one, two, three and four double points, from left to right.

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Semi-supervised acoustic and language model training for English-isiZulu code-switched speech recognition

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***Abstract*—wer wie was wieso weshalb warum wer nicht fragt bleibt dumm wer wie was wieso weshalb warum wer nicht fragt bleibt dumm wer wie was wieso weshalb warum wer nicht fragt bleibt dumm wer wie was wieso weshalb warum wer nicht fragt bleibt dumm wer wie was wieso weshalb warum wer nicht fragt bleibt dumm wer wie was wieso weshalb warum wer nicht fragt bleibt dumm wer wie was wieso weshalb warum wer nicht fragt bleibt dumm**

***Keywords*—Network information theory, two-way channels, lossy transmission, joint source-channel coding, adaptive coding.**

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A. Biswas, F. de Wet, E. van der Westhuizen, T.R. Niesler

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This work was supported in part by NSERC of Canada.

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