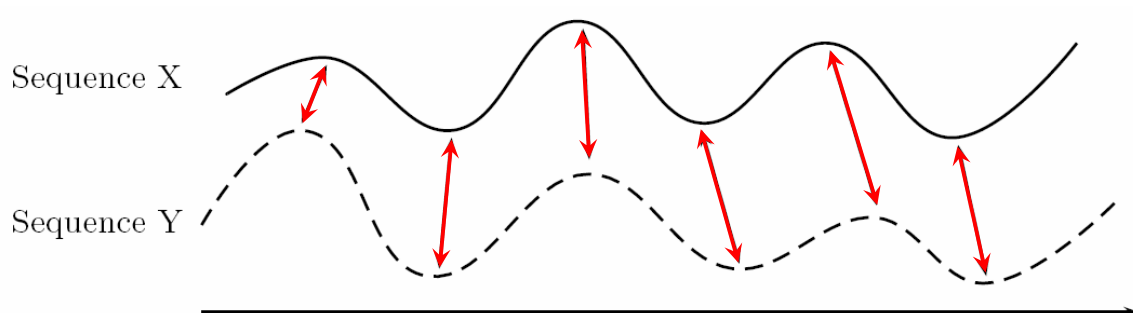Lecture
Music Processing

Dynamic Time Warping

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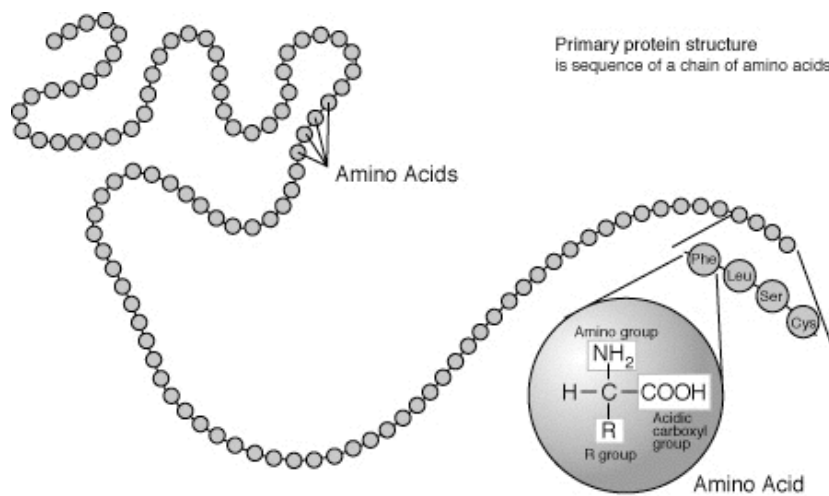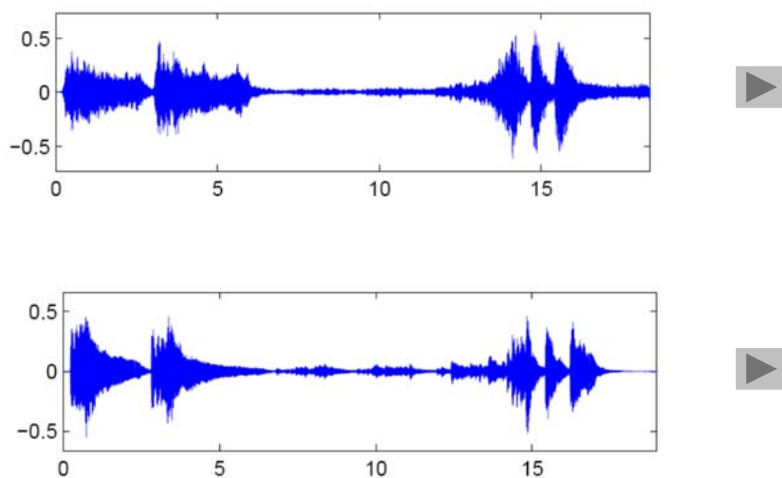
Alignment

Alignment

DNA = Sequence of Nucleotids
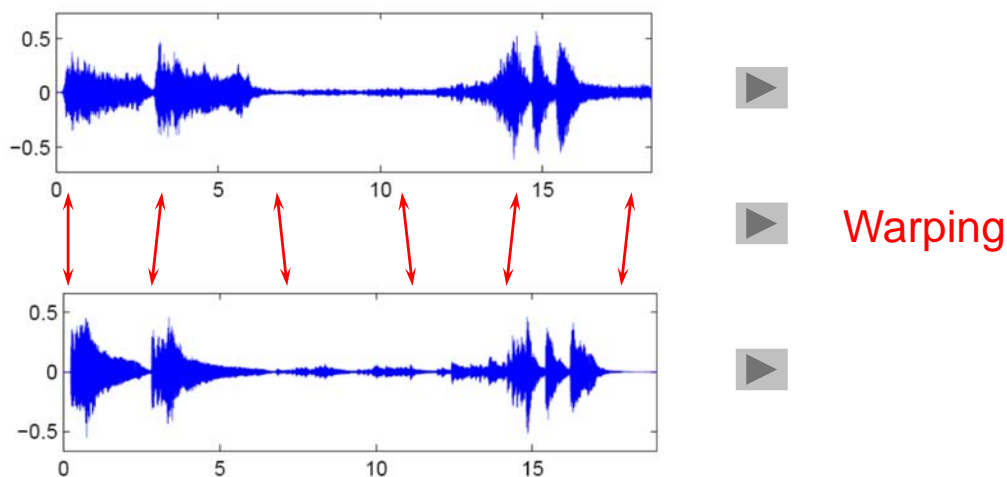
Alignment

Primary protein structure
is sequence of a chain of amino acids

Amino Acids

Phe Leu Ser Cys

Amino group
NH₂
H—C—COOH
R
R group
Acidic
carboxyl
group

Amino Acid

Protein = Sequence of Amino Acids
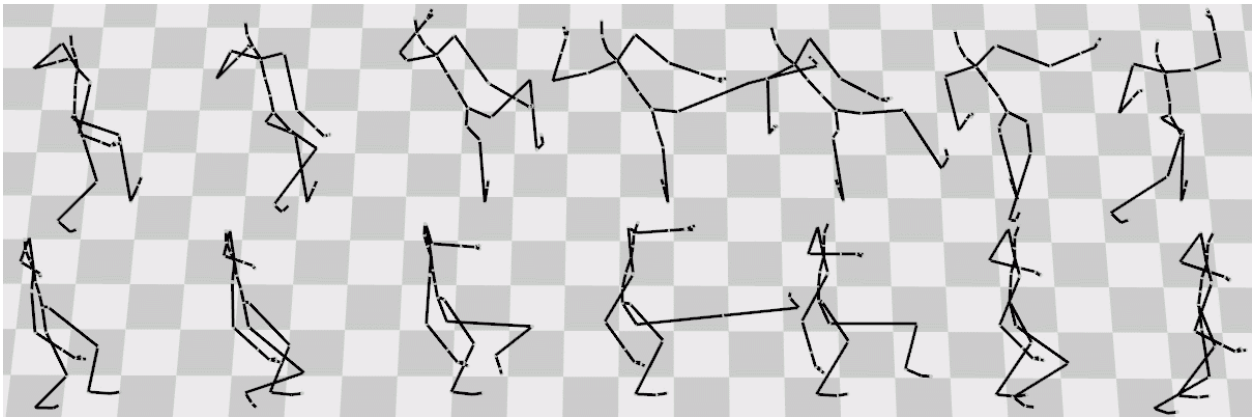
Alignment

Music = Sequence of Audio Samples

Alignment

Warping

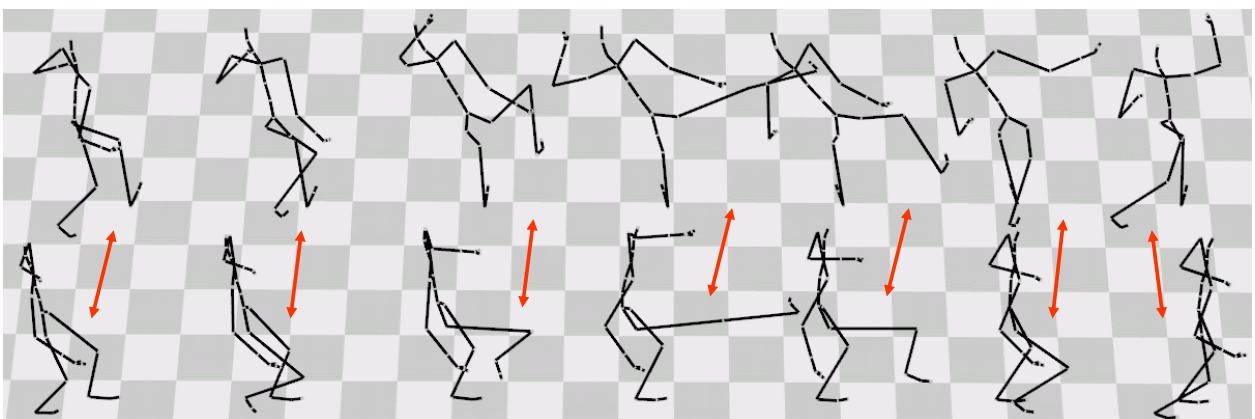Music = Sequence of Audio Samples

Alignment
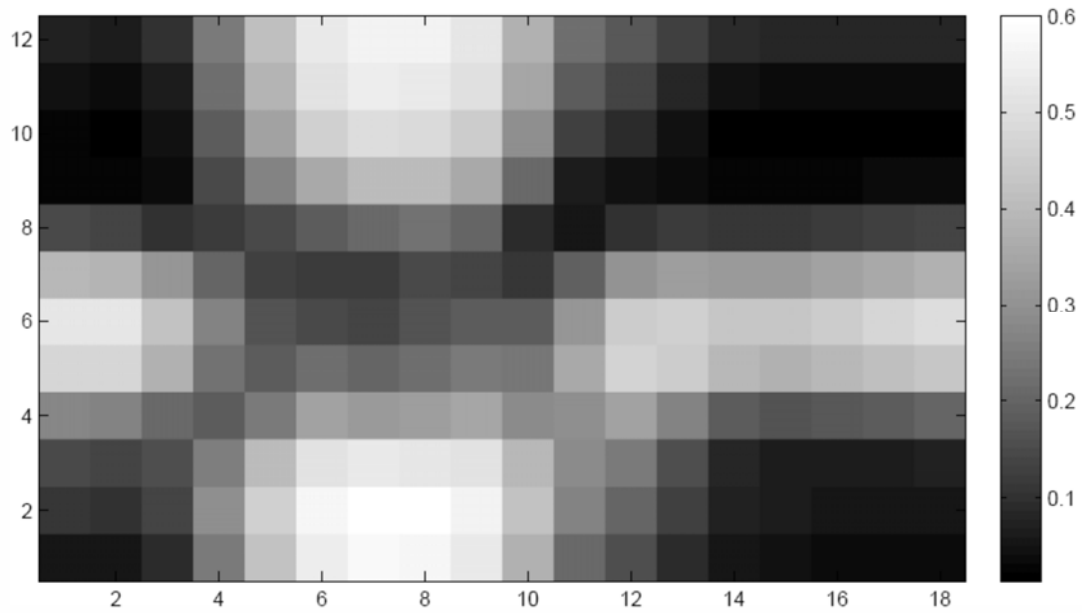

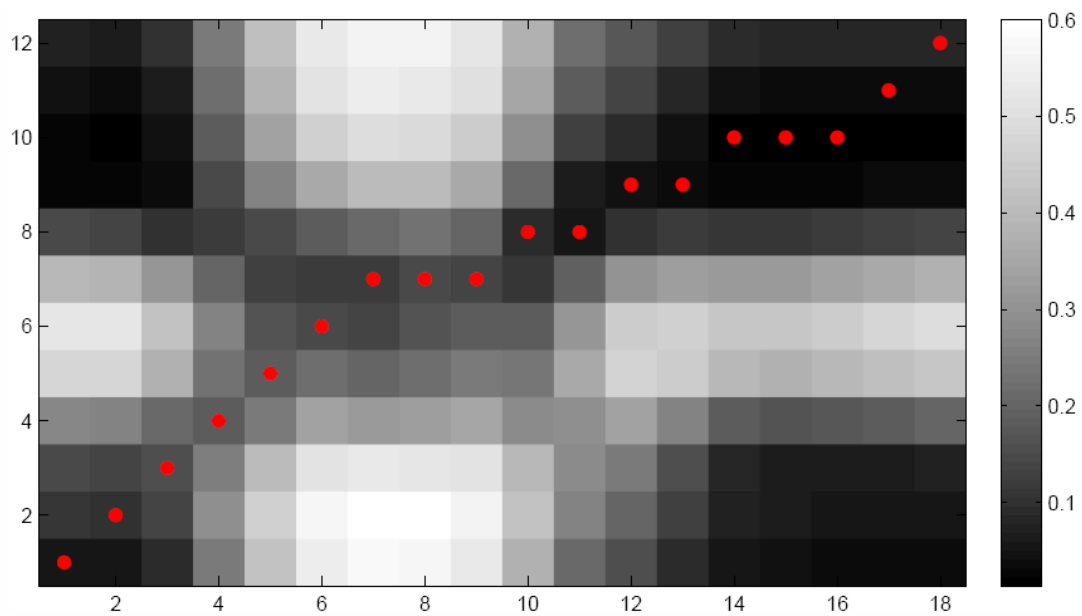Motion = Sequence of Poses

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Alignment

Motion = Sequence of Poses

Cost Matrix

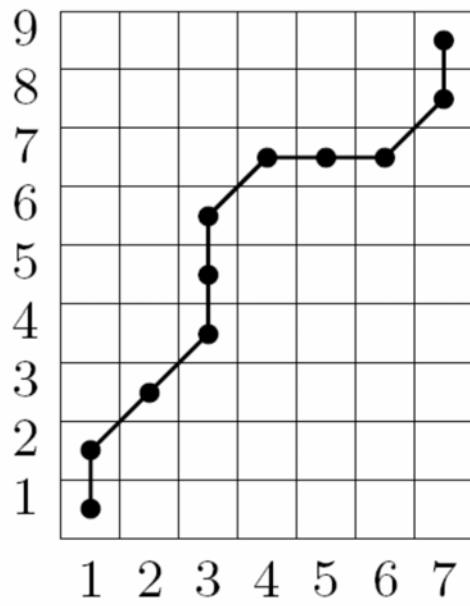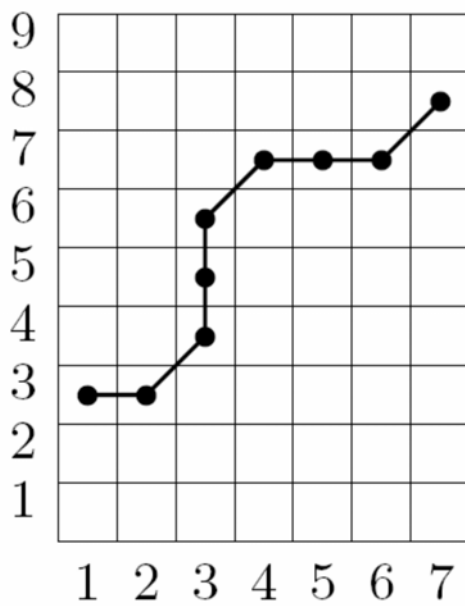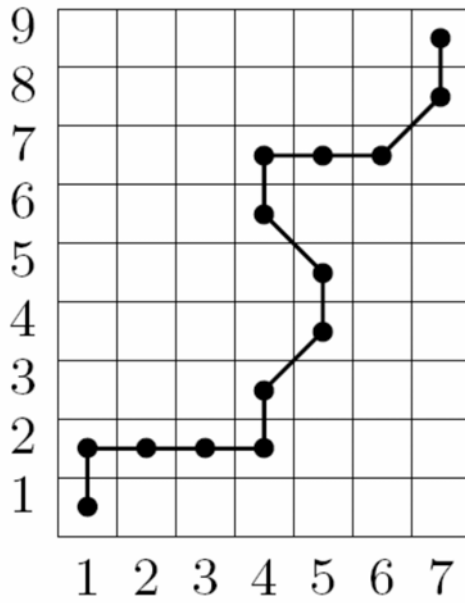# Cost Matrix

Cost-minimizing warping path
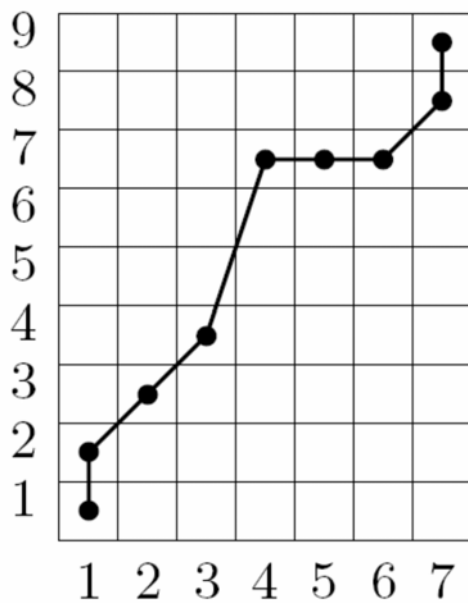
Warping Path

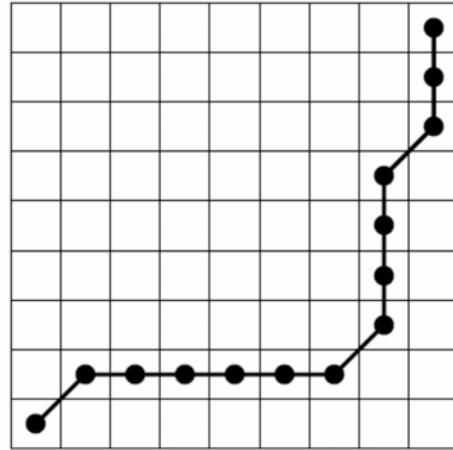# Warping Path

Violation of
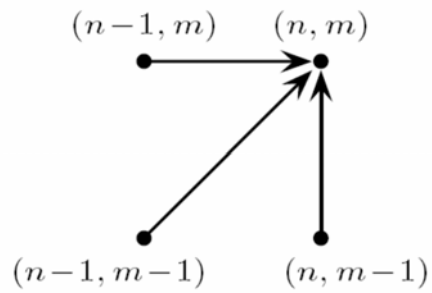Boundary Condition

Warping Path

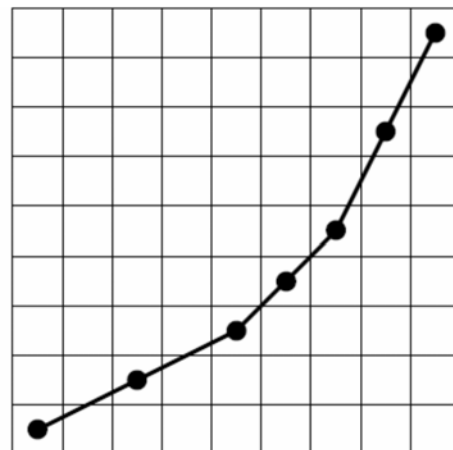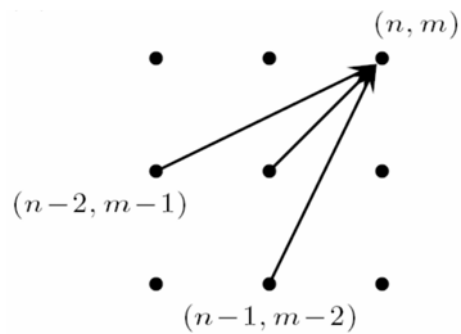Violation of
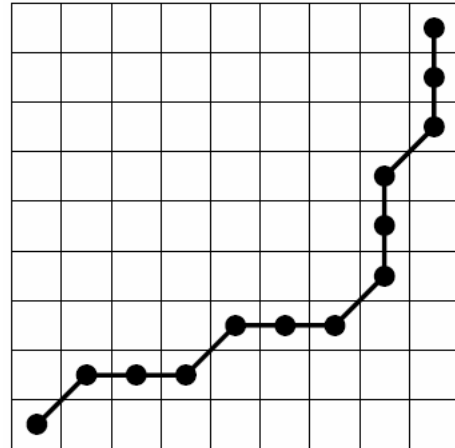Monotonicity Condition
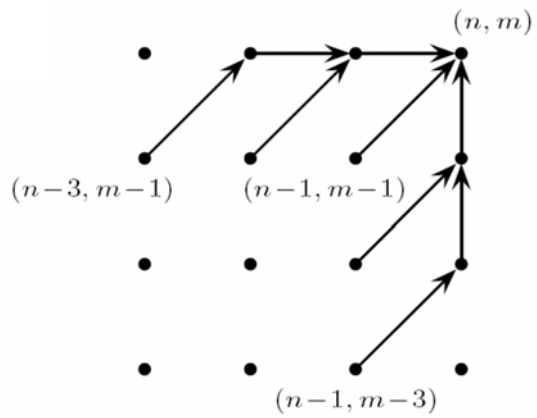
Warping Path

Violation of
Step Size Condition

Variation of Step Size Condition
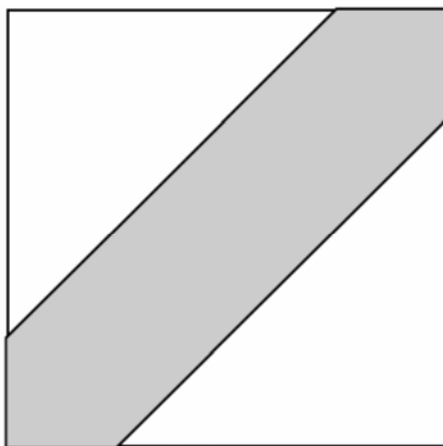

Variation of Step Size Condition
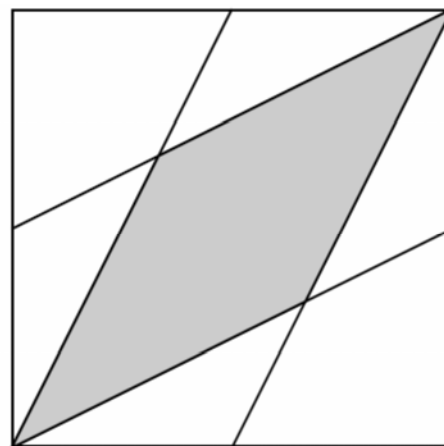
Variation of Step Size Condition

Strategy: Global Constraints

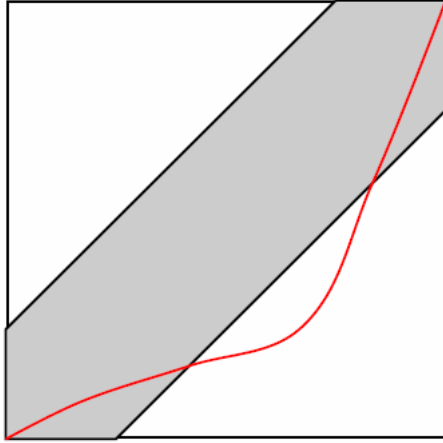Sakoe-Chiba band   Itakura parallelogram
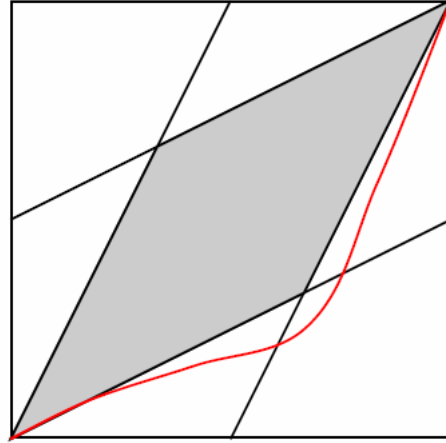
Strategy: Global Constraints
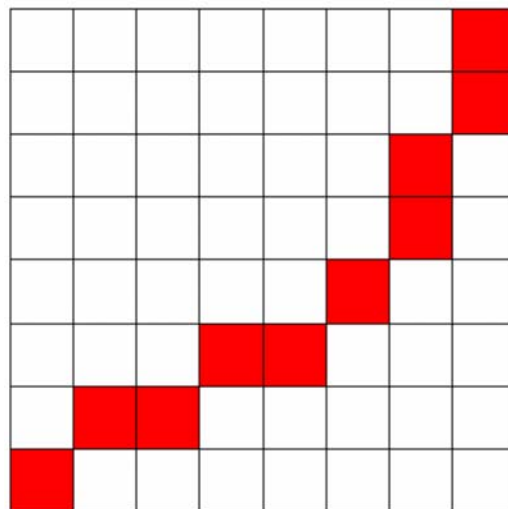
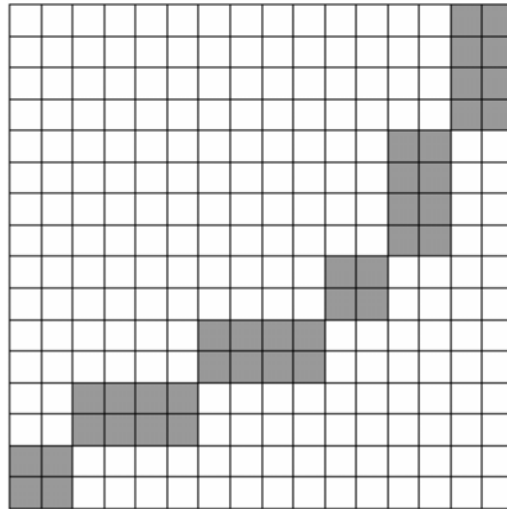Sakoe-Chiba band   Itakura parallelogram

Problem: Optimal warping path not in constraint region
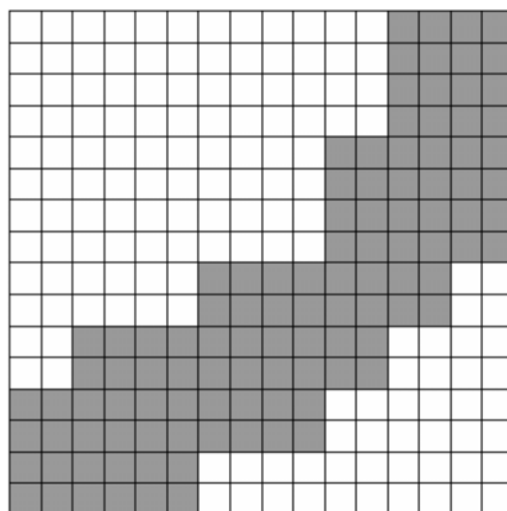
Strategy: Multiscale Approach

Compute optimal warping path on coarse level
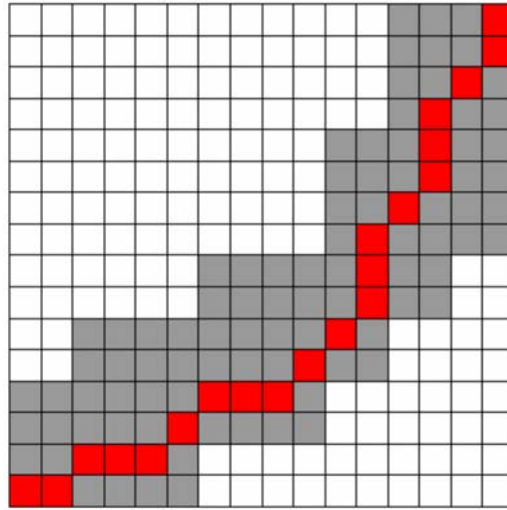
Strategy: Multiscale Approach

Project on fine level

Strategy: Multiscale Approach

Specify constraint region

Strategy: Multiscale Approach

Compute *constrained* optimal warping path

Subsequence DTW