



Musipher: Hiding information in music composition

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The team



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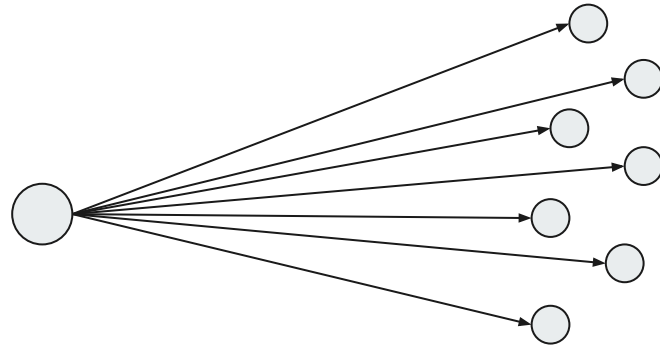
Slovak University of
Technology



Peter Spacek

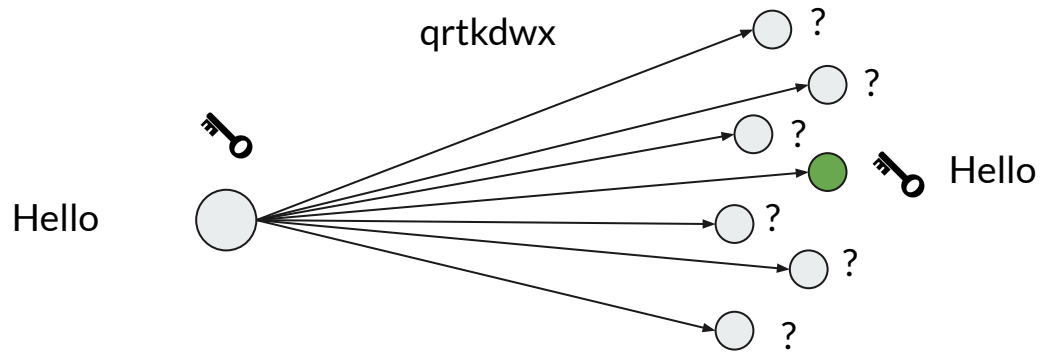


Motivation



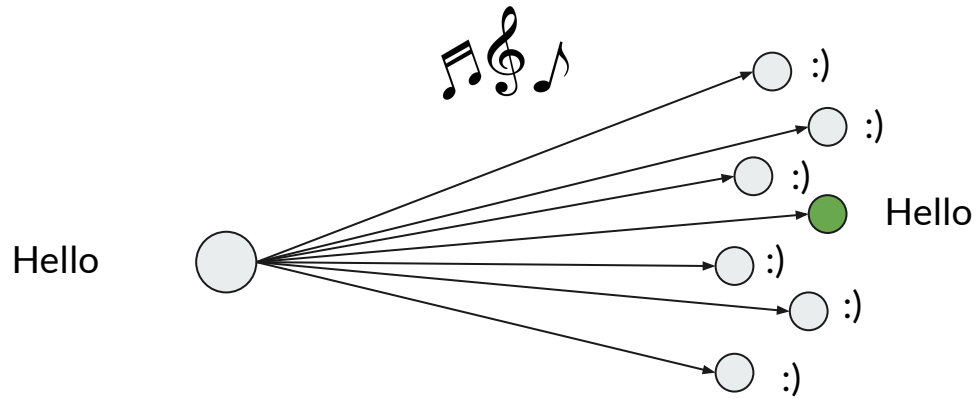


Motivation





Motivation

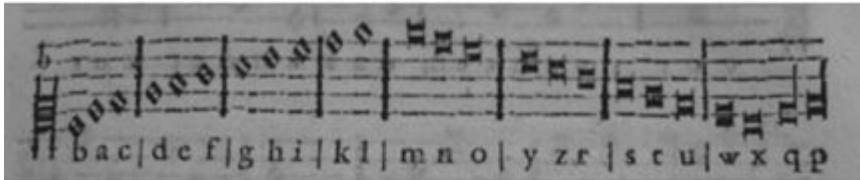


Similar research

1. Signature in a motif



2. Substitution cypher

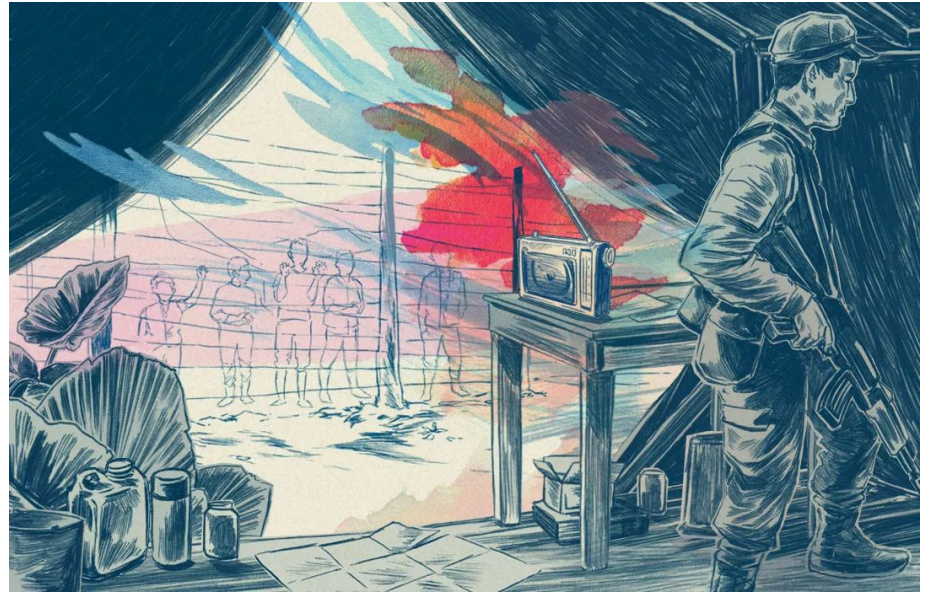


CASE: Colombia 2010

Morse code in the song

Broadcast to the general public

Decoded only by captive soldiers



Jeff Maysh: A declassified and unbelievable hostage rescue story

How to write a melody

Diagram illustrating the structure of a melody, showing two staves of music. The top staff is labeled "Phrase" and the bottom staff is labeled "Phrase". A bracket on the left side groups both staves under the label "Period". The melody is divided into segments highlighted by colored boxes: blue boxes indicate parts that can be "randomly" generated, and red boxes indicate parts that have to be determined. The top staff has a blue box covering the first two measures, a red box covering the next two measures, a blue box covering the next two measures, and a red box covering the final two measures. The bottom staff has a red box covering the first two measures, a blue box covering the next four measures, a red box covering the next two measures, a blue box covering the next two measures, and a red box covering the final two measures.

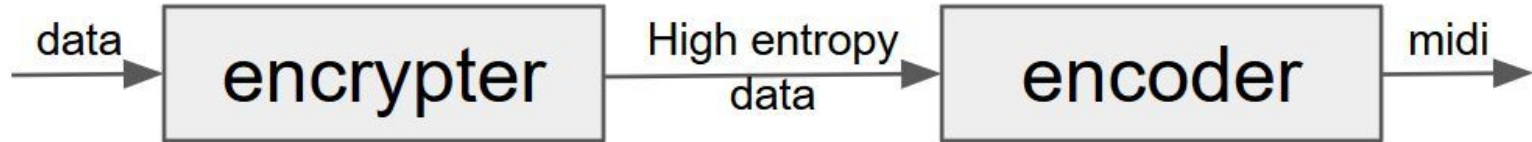
■ Parts, that can be "randomly" generated

■ Parts, that have to be determined



System design

message - BASE32 - AES128 - music composition - MIDI





Harmony

Set of all notes {0, 1, 2, 3 ... 128 };

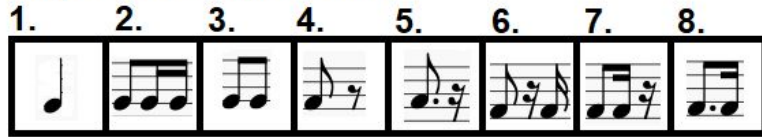
Key as a subset {0, 2, 4, 6, 7, 9 ... 127}

Chords {I, V, VI, IV};

Permutations { {0, 1, 2, 3}, {0, 1, 3, 2} ... {2, 1, 3, 0} }

Rhythm

All possible rhythmic units



Units sorted into their respective place in the period

1.	IA	IC	IB	IC	ID	IIA	IIB	1.	ID	IIA	IIC	IID	IIC	IID	1.
IIIA	IA	IIIB	IB	IIIA	ID	IIIB	IIB	IIIC	IIID	IIIC	IIID	IID	IIC	IID	1.



12 units generated from input

	A.	B.	C.	D.
I.	7.	1.	6.	5.
II.	4.	7.	4.	1.
III.	2.	8.	6.	7.





Melody

Melody generated using steps



Melody generated using leaps



Melody with repeated content



How to use software tool - brief

```
182 public static void main(String[] args) {  
183  
184     CryptoModule cryptoModule = new CryptoModule();  
185     CompositionModule compositionModule = new CompositionModule();  
186     String input = "pavolsobota";  
187     String a;  
188     String b;
```



Output:

<code>pavolsobota</code>	<code>aaaaaaaaaaaaaaaaaaaa</code>	<code>cmamctfhskd47zjp6rnkn67lafxa5</code>
Desired output	Padding symbols	Garbage output with the purpose of generating whole song

Process finished with exit code 0



Implementation details



github.com/xsobotap/Music-cipher

java, with JFugue library

of
stored
bits



music
sounds
good



Output



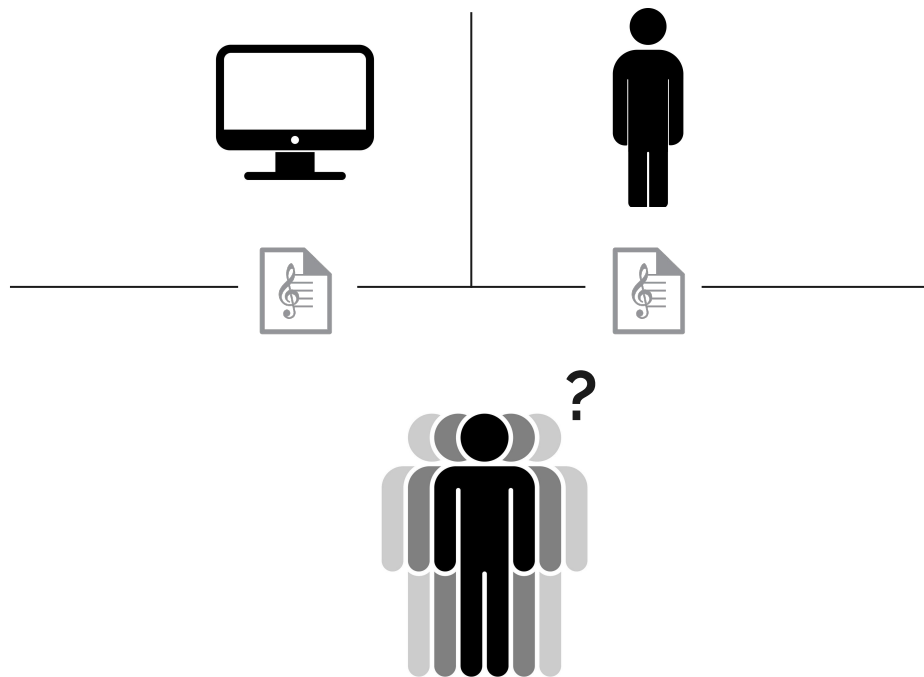
Survey

86 respondents

8 songs - 3 ours - 5 composed by humans

similar instrument

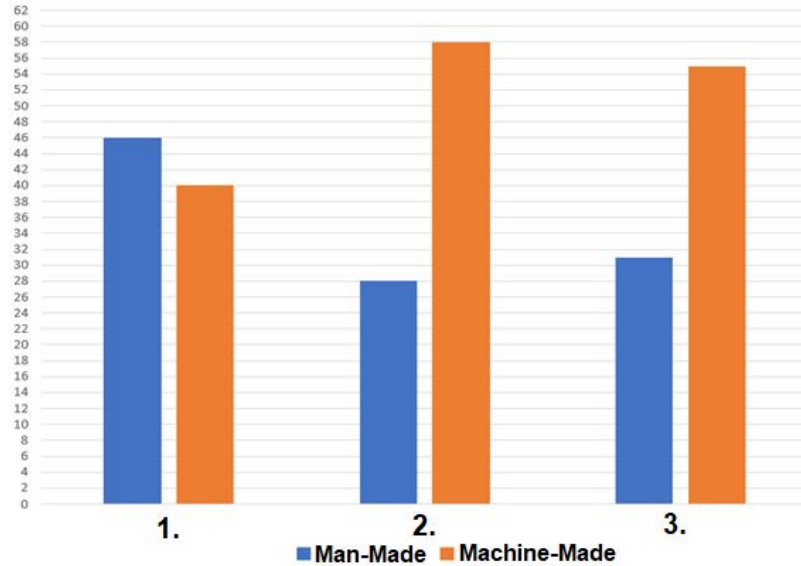
similar length





Survey

The outcome of the survey





Thank you for your attention