MysteryTwister C3

THE CRYPTO CHALLENGE CONTEST

Music Code "Vier, Neun, Fünf, Eins, Drei, Zwei, Acht" - Part 1

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Introduction to the Music Code

Monoalphabetic substitution and transposition

In 1929 the French composer Francis Poulenc composed the piece „Pièce brève sur le nom d' Albert Roussel“. By assigning notes to every letter of the alphabet (except the Y and the Z), Poulenc was able to transform the name of his musician colleague Albert Roussel to notes and with this to set it to music.

But Poulenc was not the first to experiment with music codes. Before him other famous musicians and academics already developed methods to encrypt secret messages with music (della Porta, Debussy, Ravel).

Introductory Example

MTC3-Jingle

What follows is a more advanced substitution technique:

	C	C#	D	D#	E	F	F#	G	G#	A	Bb	B
1	P	I	7	M	0	8	U	2	O	H	5	A
2	Q	T	C	S	R	W	9	V	4	E	Z	K
3	N	D	1	X	L	3	B	J	Y	6	F	G

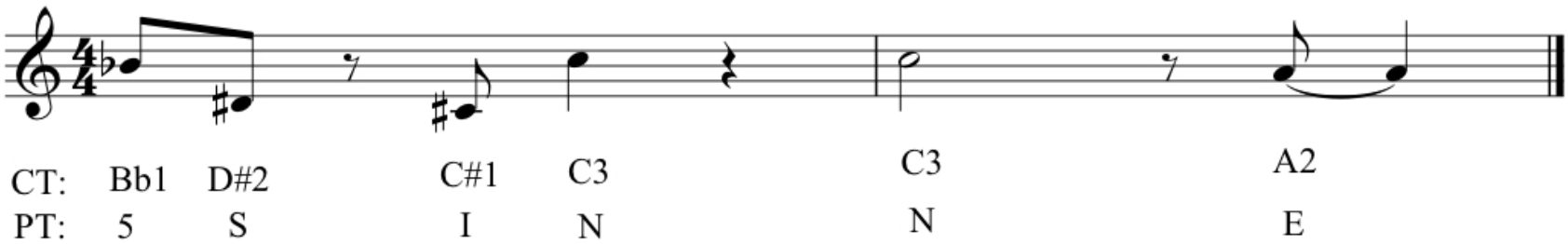
In the first row, the 12 notes of the chromatic scale are listed. In the left column are the 3 groups representing the duration.

To place the note into the right group (1, 2 or 3) the duration until the next note is essential. This means that within this duration even the rests have to be considered. For the last note of the piece, the duration until the double bar line is the determining factor.

1. group: less than a quarter beat (i.e. an eighth note, a dotted-eighth note, a sixteenth note, a sixteenth note + a sixteenth rest, etc.)
2. group: the duration is between a quarter beat and less than two quarter beats (i.e. a quarter note, a dotted-quarter note, a quarter note + an eighth rest, etc.)
3. group: two quarter notes or more (i.e. a half note, a whole note, a quarter note + a half rest, etc.)

Example

(CT: Cipher Text, PT: Plain Text)



If, for example, an eighth rest follows on an eighth note, those will be added, so that now we have a duration of one quarter beat. This combined value of note and rest will then be placed into group 2 (see the ciphertext D#2 above).

Using the table from above we encrypt the (German) sentence:

AUCH DER TUECHTIGE BRAUCHT GLUECK
(means: even the brave needs luck)

This encrypts with the substitution to:

B1, F#1, D2, A1, C#3, A2, E2, C#2, F#1, A2, D2, A1, C#2, C#1, B3, A2, F#3, E2, B1, F#1, D2, A1, C#2, B3, E3, F#1, A2, D2, B2

And now for the transposition:

As key for the transposition we use an arbitrary note sequence: g' – f' – c' – b♭′ – a' – c" . Each of this six notes generates a column. Next, the cipher text symbols are written into the columns.

g'	f'	c'	b♭'	a'	c"
B1	F#1	D2	A1	C#3	A2
E2	C#2	F#1	A2	D2	A1
C#2	C#1	B3	A2	F#3	E2
B1	F#1	D2	A1	C#2	B3
E3	F#1	A2	D2	B2	D#3

Because the text only consists of 29 symbols, one symbol (X: encrypted D#3) is added to complete the matrix.

Now the notes of the key melody are sorted according to their tone pitch and like this the columns are interchanged. The lowest note (c') is placed at the first position and the highest note (c") at the last. This leads to the following matrix:

c'	f'	g'	a'	b♭'	c"
D2	F#1	B1	C#3	A1	A2
F#1	C#2	E2	D2	A2	A1
B3	C#1	C#2	F#3	A2	E2
D2	F#1	B1	C#2	A1	B3
A2	F#1	E3	B2	D2	D#3

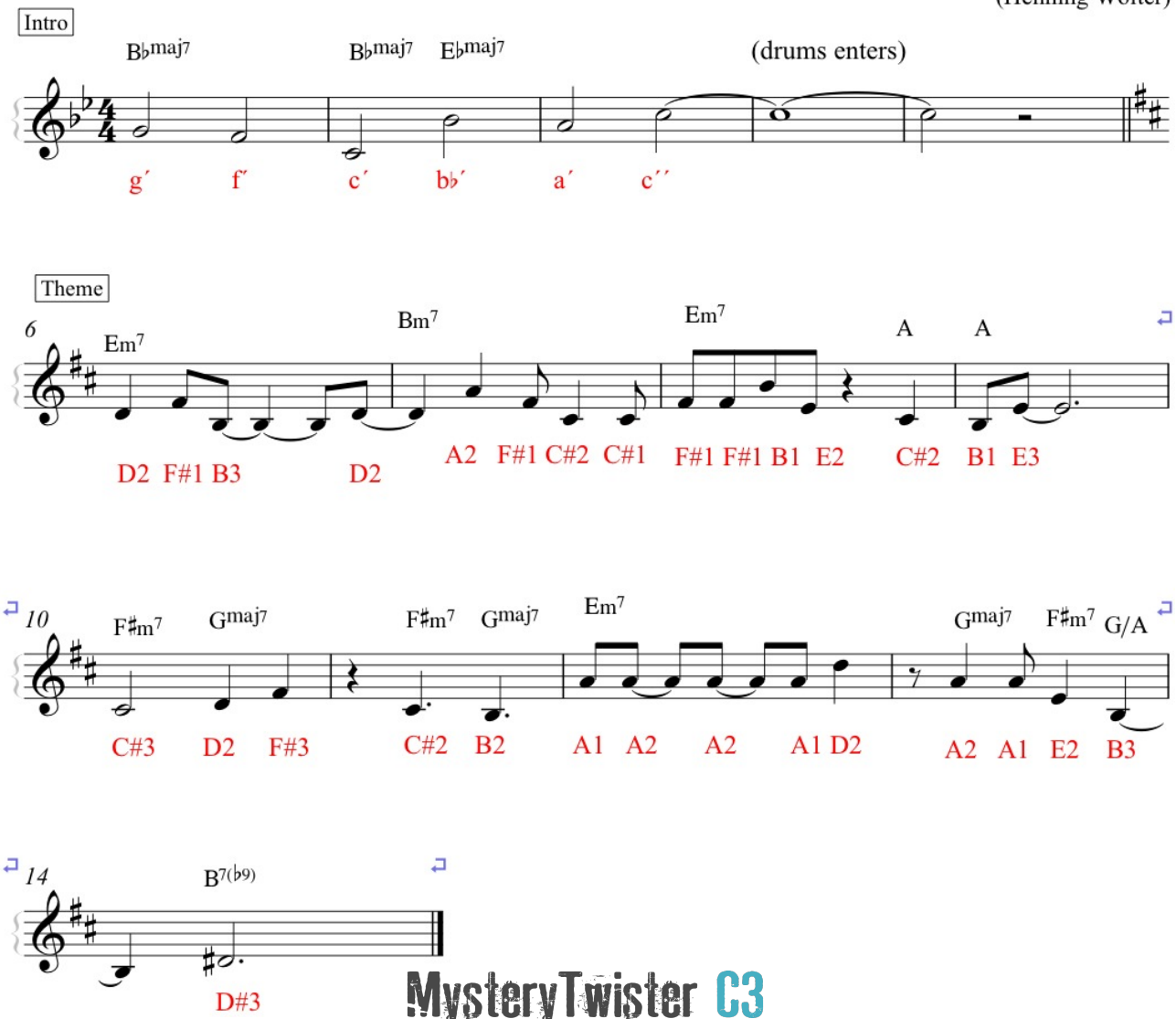
The next step is to transfer the symbols onto paper in music notation:

The note sequence g' – f' – c' – b♭' – a' – c" , which is our key, is used as intro of the piece.

The cipher text is read out column-wise from the matrix and forms the theme of the piece. The encrypter can decide in what octave the notes are notated. Furthermore, he has some leeway concerning what note value he chooses within the relevant group (1-3) and how he will potentially combine the note values and rest values. To get to the result from the additional file *MTC3-Jingle.mp3*, the harmonic context decides, if, for example, a F# is noted as F# or as Gb (see additional file *little_lesson.pdf*, enharmonic equivalents).

MTC3 - Jingle

(Henning Wolter)



The Challenge

Vier, Neun, Fünf, Eins, Drei, Zwei, Acht

Listen to the composition „Vier, Neun, Fünf, Eins, Drei, Zwei, Acht“ (*VierNeunFünfEinsDreiZweiAcht.mp3*) and have a look at the corresponding notes (*VierNeunFünfEinsDreiZweiAcht.pdf*).

According to the substitution method from above different notes were assigned to the numbers 0-9 and the 26 letters of the alphabet (overall 36 plaintext symbols).
(The arrangement of the symbols in the substitution table differs from the one used for the example MTC3-Jingle.)

After the substitution, a transposition was performed.

The Challenge

In this part, your challenge is to solve the transposition. Therefore, assign the 105 notes from the file *VierNeunFünfEinsDreiZweiAcht.pdf* into ciphertext symbols, as described in the example above. Enharmonic equivalents are accepted (i.e.: C#3 = Db3).

Thereafter, reverse the used transposition and send in the 105 received notes in the right order. Separate the single notes (including possible special characters) with a blank (i.e.: C3 F2 B1 Db2 F#2 ...) and give the entire solution in one line.

Hints:

The key for the transposition is hidden in the title of the piece. It may not be the most obvious kind of hint.

Having solved this challenge you can set out to solve part 2 of this challenge (level 2).