SATB

A Colourful Game of Musical Puzzles

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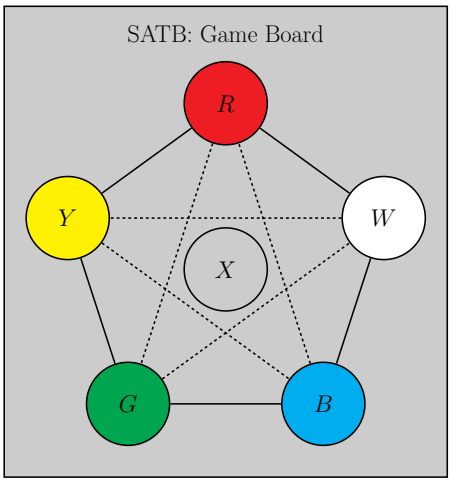
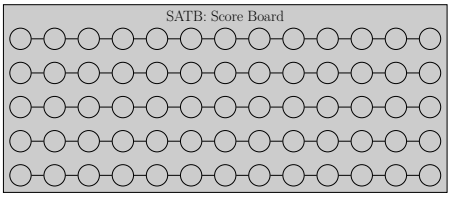
1 Introduction

SATB is a game for 1-5 players who work together to create a *composition*. A composition is a two-dimensional array of *colours*. Each row of a composition is called a *voice* while each column is called a *beat*. Players create compositions by choosing which colour each voice will play on each beat.



(a) The SATB game board.



(b) The SATB score board.

Figure 1: Game components.

2 Colours and Rests

There are five colours in an SATB composition: R, W, B, G, and Y. Each colour is represented by a corresponding space on the game board. The sixth space on the game board, X, represents a rest. We impose a structure on these five colours. This structure is depicted on the game board by solid and dashed lines. If two colours are connected by a solid line then we say that they are *adjacent*. If two colours connected by a dashed

line then they are not adjacent. On each beat, each voice will either *play a colour* or *rest*.

3 Composition Rules

Each composition must satisfy a set of rules which ensure that all of the voices are both individually interesting and mutually consistent with one another.

3.1 Rhythm

As described in the introduction, each composition is divided up into a sequence of beats. On each beat, each voice must either play a colour or rest. Furthermore, the voices must collectively obey the *continuity* rules:

R1 No more than one voice may rest on each beat.

R2 No voice may rest on more than one consecutive beat.

3.2 Melody

A *melody* is a sequence of colours and rests played by a single voice. A *repeat* is a when a voice plays the same colour on two consecutive beats. A *step* is when a voice plays two adjacent colours on two consecutive beats. A *skip* is when a voice plays two non-adjacent colours on two consecutive beats. The direction of a step or skip is the direction (clockwise or anticlockwise) that a token would travel on the game board when it moves via the shortest path between the two spaces depicting the two colours involved. A melody must obey the *phrasing* rules:

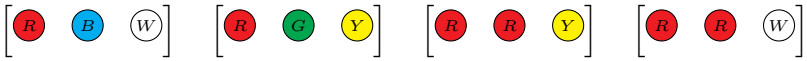
M1 A repeat must be followed by a step.

M2 A skip must be followed by a step in the opposite direction.

A *phrase* is a sequence of colours that obeys the phrasing rules. Notice that a phrase may not be interrupted by a rest.

Example 3.1 *There are two two-beat phrases that start with R:*

and four three-beat phrases that start with R:



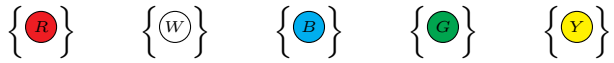
3.3 Harmony

Harmony is when several different colours are played on the same beat by different voices. A *chord* is a set of colours that obey the *consonance* rule:

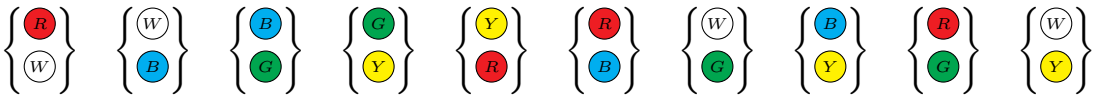
H1 No more than two colours in a chord may be adjacent.

A three-note chord consists of two adjacent colours and a third isolated colour. This isolated colour is called the *root* of the chord.

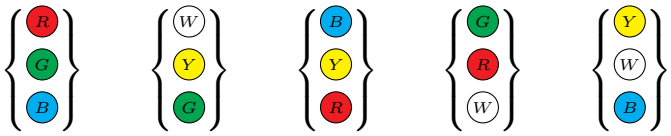
Example 3.2 *There are five one-colour chords:*



ten two-colour chords:



and five three-colour chords:



3.4 Counterpoint

Counterpoint is when several voices play simultaneously. A pair of voices move in *similar motion* if they both step or skip in the same direction. A pair of voices move in *contrary motion* if they step or skip in opposite directions. A pair of voices move in *oblique motion* if one voice repeats a colour while the other voice changes colours. A pair of voices move in *parallel motion* if they play the same colours for two consecutive beats.

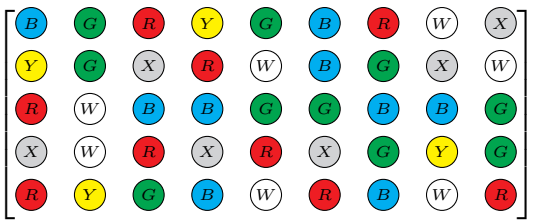
A group of melodies played in counterpoint must satisfy the *voice leading* rules:

C1 At least one voice must move on each beat.

C2 At least one pair of voices must move in contrary or oblique motion on each beat.

C3 No pair of voices may move in parallel motion.

Example 3.3 *This composition follows the rules established above:*



4 Game Play

The composition rules provide criteria that can be used to evaluate a composition but do not explain how the players create compositions during a game of SATB. This section describes several options for how to do so.

4.1 Free Play

Of course, the simplest way to play is for the players to create a composition that obeys all of the composition rules. This is perhaps the purest form of play but is not really a game per se. Free play is a great way to explore the system defined by the composition rules or to create compositions that are aesthetically pleasing.

4.2 Figured Bass

One embellishment that can be added to the free play version of SATB is a set of requirements that players' compositions must satisfy. Unlike the composition rules established in Section 3, these new requirements can change from composition to composition. This transforms the experience from one of unstructured play into more of a puzzle-solving challenge. The musical notation known as *figured bass* provides one way to impose requirements on a composition without completely specifying each voice.

In figured bass, only the *bass voice* is written out explicitly. The chords that are meant to accompany that voice are described in general terms. Other voices then improvise melodies that are consistent with the structure that is thereby established.

TODO: Describe how figured bass notation will work in SATB.

Example 4.1 *The composition from Example 3.3 is consistent with the following figured bass structure:*

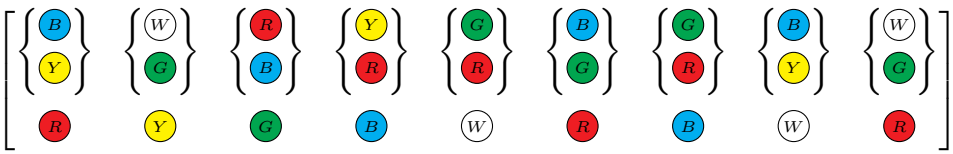


Table 1: Generate a random figured bass structure for a composition.

(a) Generate random phrases to create a bass voice for a composition.

Die Roll	First Move	Second Move
1	Step clockwise	-
2	Step anticlockwise	-
3	Repeat	Step clockwise
4	Repeat	Step anticlockwise
5	Skip clockwise	Step anticlockwise
6	Skip anticlockwise	Step clockwise

(b) Generate random chords to accompany each colour in the bass voice.

Die Roll	Bass Voice				
	R	W	B	G	Y
{1, 2}	{B, G}	{G, Y}	{Y, R}	{R, W}	{W, B}
{3, 4}	{W, G}	{B, Y}	{G, R}	{Y, W}	{R, B}
{5, 6}	{B, Y}	{G, R}	{Y, W}	{R, B}	{W, G}