Metronome

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# Feasibility study

I would like to make a web based metronome. A metronome is…

I know that this problem is solvable because the problem (working out how fast to make beepy sounds) can be solved in a finite number of steps. The main calculation is converting a BPM (e.g. 60 beats per minute) to the delay (in milliseconds) between each beep. This is computationally simple using a theoretical approach.

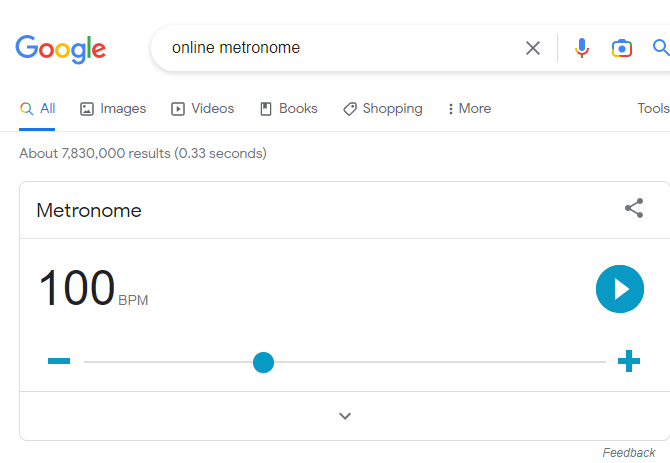
The budget is limited (£0) and we have 2 weeks to complete the project.

# Analysis

## Stakeholders

Joel is a 6 year old boy who’s just started drumming. He wants a simple to use metronome app that he can use on his android tablet to drum along to each day.

## Research



[https://www.google.com/search?q=online+metronome](https://www.google.com/search?q=online+metronome8&safe=active&ssui=on)

Google has a built in metronome. It’s free and really easy to use. It has a nice visual pulsing feature so you don’t need audio enabled. However, it doesn’t indicate how far through each measure you are like a traditional metronome.

## Essential features

My solution must allow you set the BPM and start / stop the beat. On each beat it should make an audible tick and give a visual indication in case someone can’t hear the tick.

The solution must work on any web enabled device with a clear, touchscreen friendly interface.

There should be limited text so it’s suitable for small children.

There should be buttons to allow you to increase or decrease the BPM by 5 without starting / stopping the beat.

It should be freely accessible online.

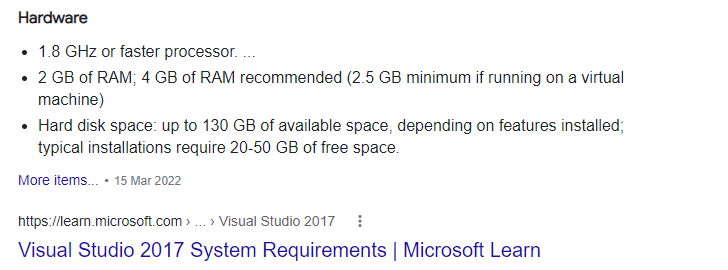
## Limitations

There is insufficient time to add additional features but these could be added later. My solution will not allow you to compare your playing to the beat to see how in time you are. There will be no feature to log in and track your progress. It would be great if there was a feature to change the BPM automatically over time but this is not essential as development time is limited.

There is no requirement to make a native android or apple app: the metronome will be purely web based in order to make it freely available to as many people as possible.

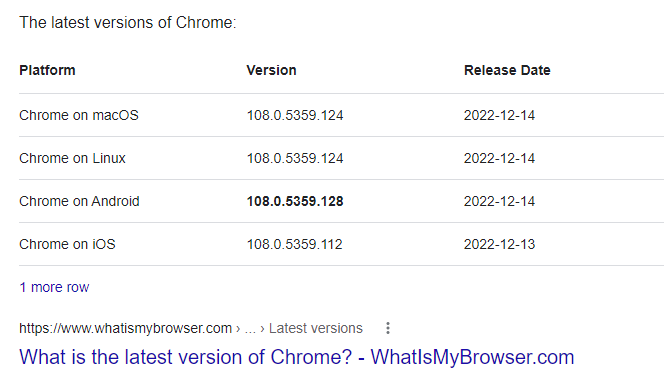
## Hardware and software requirements

For development, I need to be able to use Visual Studio 2017 which requires:



<https://learn.microsoft.com/en-us/visualstudio/releases/2017/vs2017-system-requirements-vs>

For the stakeholders to run the metronome they need a web enabled device running a modern browser (e.g. chrome)



<https://www.whatismybrowser.com/guides/the-latest-version/chrome>

This is so that all the features of css / javascript / HTML5 work as expected.

My stakeholder has a Samsung Galaxy Tab A7 32 GB Wi-Fi Android Tablet - Dark Grey (UK Version)

|  |  |
| --- | --- |
| **Screen size:** | 10.4” diagonal  1200x2000 224ppi density |
| **OS:** | Android 12 |
| **Storage:** | 32Gb |
| **RAM:** | 4Gb |

## Success Criteria

|  |  |  |
| --- | --- | --- |
| Number | Criteria | Justification |
| 1 | Must be accessible on a android 12 device in Chrome connected to the internet | The stakeholder has an android 12 device with a reliable WiFi connection. Any updates to the app can be automatically rolled out to the users |
| 2 | User can set the BPM | The stakeholder wants to practice between 50BPM and 120BPM |
| 3 | Any invalid BPM will be automatically corrected to the closest sensible value between 50-120BPM | The stakeholder wants to focus on drumming and might accidentally type in invalid data |
| 4 | The user should be able to increase the BPM by 5 using a touch button | The stakeholder wants to be able to practice drumming at different speeds as they become more proficient |
| 5 | The user should be able to decrease the BPM by 5 using a touch button |
| 6 | There should be a start and stop button that toggles when you press it | The user should be able to control the metronome with their finger with a really simple UI |
| 7 | When the metronome starts there should be an audible beep | The stakeholder wants to drum along to a click sound in headphones |
| 8 | When the metronome starts there should be a visual indication showing whenever it would ‘tick’ | Sometimes the metronome would be used with the sound turned off. |
| 9 | There should be a high contrast mode button which toggles a black and white colour scheme with a larger text | Sometimes the metronome will be on a small screen a reasonable distance from the drummer and they need to see it at a glance without misreading any of the numbers |

# Design

## Algorithms

The user should be able to enter the BPM score (beats per minute). The browser needs to know how long to pause between each tick in milliseconds. This can be done using the following algorithm.

BPM = user input

Interval = 1 \* 60 \* 1,000/BPM

## Usability features

Normal mode:

50

Start

High contrast mode:

50

Start

The high contrast option should be all black and white with larger text so that it can be visible from a distance on small screens with a high (224) DPI. It will also be usable by people who are partially sighted or colour blind.

The decrease button is on the left because western audiences associate reading from left to right so a smaller number would be on the left of a number line.

The largest UI components are the BPM editable text box and the start / stop button because…

## Variables and validation

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Data type** | **Validation** | **Justification** |
| BPM | Integer | Range check (between 50 -120) | The beats per minute should be anything from just less than one to two beats per second |
| BPMUserInput | String | Presence Check and TypeCheck | The BPM should be able to be converted to an integer between 50 and 120 BPM |
| IntervalMS | Integer | Make sure it’s rounded to 0 dp | The browser needs an interval between ‘ticks’ in milliseconds as a whole number |
| HighContrastMode | Boolean | True or false | Checkbox can be ticked or not ticked |
| IsPlaying | Boolean | Either true or false | The metronome can either be playing or paused. |
|  |  |  |  |
|  |  |  |  |

## Testing

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test number** | **Description** | **Success Criteria** | **Test data** | **Expected result** |
| 1 | Basic web page | 1 | Page load | A web page with a title and text box to enter the BPM score and two buttons to increase / decrease the BPM score displays in chrome |
| 2 | BPM | 2 | 120 | Valid data accepted |
| 3 | BPM | 3 | “” | BPM to be set to 50 |
| 4 | BPM | 3 | 30 | BPM to be set to 50 |
| 5 | BPM | 3 | 130 | BPM set to 120 |
| 6 | BPM | 3 | Potato | BPM set to 50 |
| 7 | Increasing BPM | 4 | BPM set to 60. Press increase | BPM increases up to 65 |
| 8 | Increasing BPM | 4 | BPM set to 120  Press increase | BPM stays at 120 |
| 9 | Increase BPM | 4 | BPM set to 119  Press increase | BPM set to 120 |
| 10 | Decrease BPM | 5 | BPM set to 60. Press decrease | BPM decreases to 55 |
| 11 | Decrease BPM | 5 | BPM set to 50  Press decrease | BPM stays at 50 |
| 12 | Decrease BPM | 5 | BPM set to 52  Press decrease | BPM set to 50 |
| 13 | Start metronome | 6 | BPM set to 60. Not currently playing.  User presses start. | Start button changes to stop |
| 14 | Stop metronome | 6 | BPM set to 60 and metronome currently playing. User presses stop | Stop button changes back to start |
| 15 | Audible beep | 7 | BPM set to 60. Press start | Hear a tick every second |
| 16 | Audible beep | 7 | BPM set to 120  Press start | Hear two ticks every second |
| 17 | Visual indication | 8 | BPM set to 60  Press start | See an animation that indicates when a tick occurs (one every second) |
| 18 | High contrast | 9 | High contrast button clicked | UI changes to black and white. Text size increases |
| 198 | Disable high contrast | 9 | High contrast button clicked twice | UI changes back to normal colour mode. Text resets to normal size. |

## Post development testing

Here are some questions to give my stakeholders after I’ve finished developing the solution:

Functionality

What did you want the program to do? What did you click on (exactly, in what order)? What happened? Did the program do everything you wanted it to do? Were there any features that you wished were there but weren’t?

Robustness

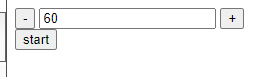
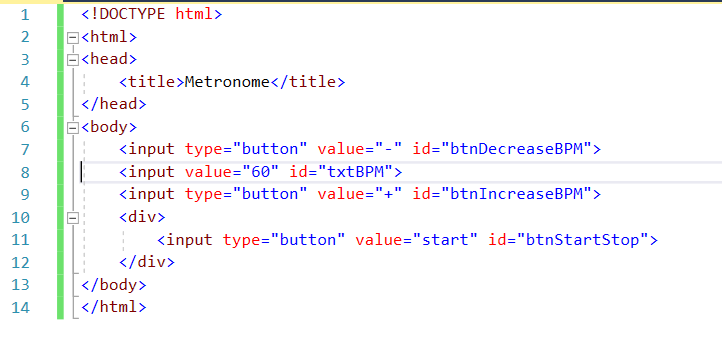
Did the program crash? If so, when (what did you do immediately before? What were you trying to do?)

Usability

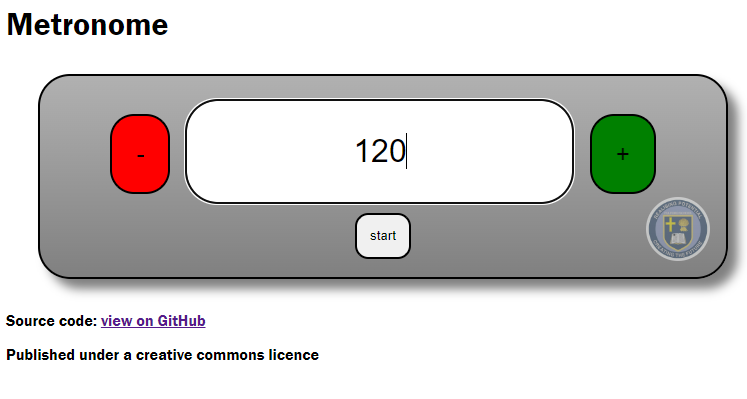
# Implementation

The first thing I need to do is get a simple UI with all of the buttons so that the stakeholder can see what the final metronome will look like

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Test number** | **Description** | **Success Criteria** | **Test data** | **Expected result** | **Actual result** |
| 1 | Basic web page | 1 | Page load | A web page with a title and text box to enter the BPM score and two buttons to increase / decrease the BPM score displays in chrome | Pass |



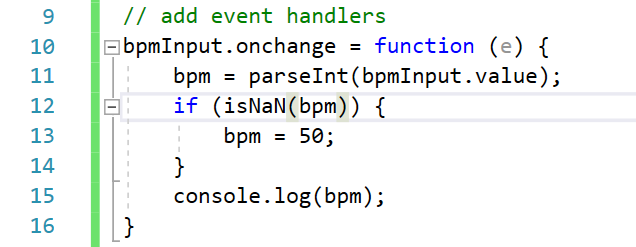
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Test number** | **Description** | **Success Criteria** | **Test data** | **Expected result** | **Actual result** |
| 2 | BPM | 2 | 120 | Valid data accepted | **120 allowed** |

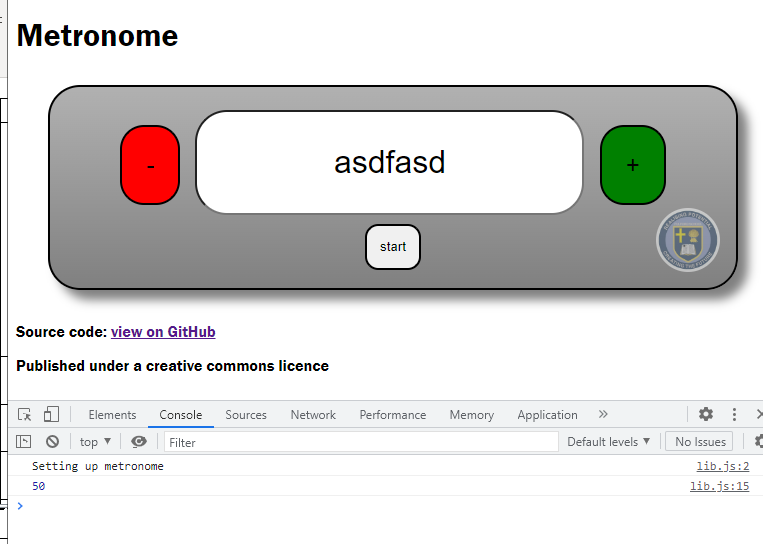


HTML:

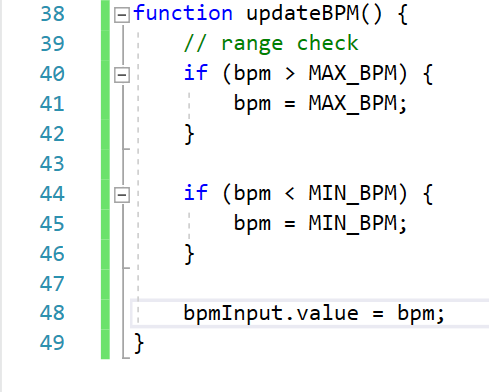


|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Test number** | **Description** | **Success Criteria** | **Test data** | **Expected result** | **Actual result** |
| 3 | BPM | 3 | “” | BPM to be set to 50 | **BPM set to 50** |





|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Test number** | **Description** | **Success Criteria** | **Test data** | **Expected result** | **Actual result** |
| 8 | Increasing BPM | 4 | BPM set to 120  Press increase | BPM stays at 120 | Fail: BPM keeps increasing |





Clicking on the increase BPM button when the BPM is already set to 120 limits it to 120.

I’ve added a range check validation to ensure that the BPM only stays between 50 and 120BPM

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# Testing

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# Installation

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# Evaluation

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# Maintenance

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