

**Architetture dei Sistemi
Di Elaborazione**

Computer Architectures

Extra_point[1]
Max 2 points

Expected delivery of extrapoint2.zip must include:
- zipped project folder

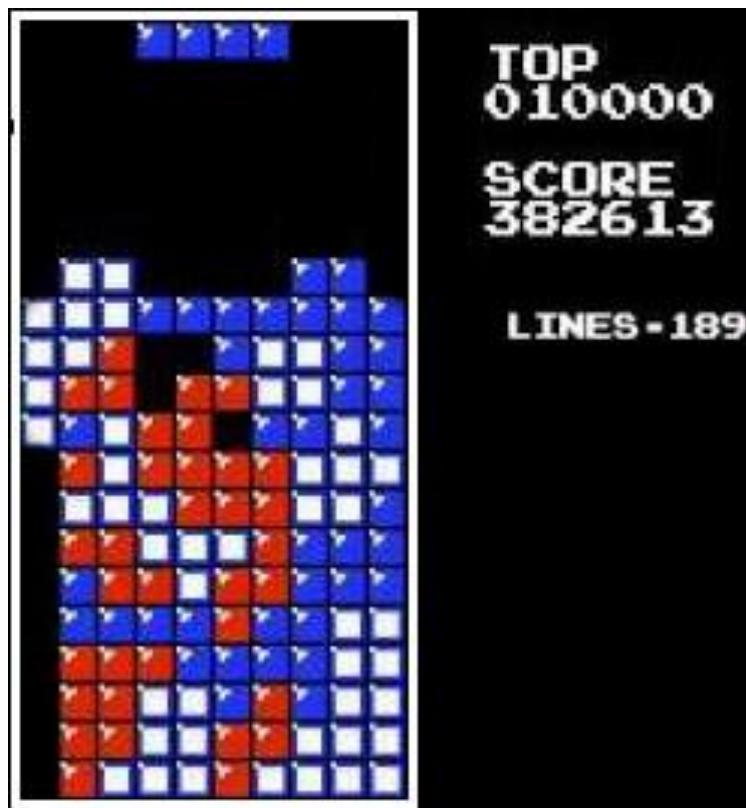
Delivery deadline: 22/01/2026

Read carefully the request and deliveries!

Purpose of Part 2: to enhance a previous developed project and acquire full confidence in the usage of the KEIL IDE and the LPC1768 on the LANDTIGER Board.

This part is evaluated to assign a maximum of 2 extra-points for qualified students taking the exam with a mark >= 18

Tetris



Tetris' gameplay consists of a rectangular field in which pieces called **tetrominoes**, geometric shapes consisting of **four connected squares**, descend from the top-center. During the descent, the player can **move the piece horizontally** and **rotate** them until they touch the bottom of the field or another piece. The player's goal is to stack the pieces in the field to create horizontal lines of blocks. When a line is completed, it disappears and the blocks placed above fall one row. The game ends if the accumulated pieces in the field block other pieces from entering the field, a process known as "topping out". Common mechanics among Tetris versions include **soft drop** (increasing the descent of the piece) and **hard drop** (instantly placing the piece as far down as it can go).

The objective of Tetris is to collect as many points as possible during a gameplay session by clearing lines. The more lines cleared at once, the higher the score for a line clear. Clearing four lines at once using an I-shaped tetromino is referred to as a "Tetris".

You can try the official online version [here](#).

Implementation details for LandTiger Board

For this second part, the emulator can be used but it is not sufficient to be able to implement the last request for this work (which will be highlighted in **YELLOW**).

Please deliver a zip folder with **all the files of your project** (you must save the project with all the compilation options you used).

Remember that if you import files in your project from another folder (e.g. when importing source files from another template) **Keil does not copy the file in your project folder automatically.**

Copy the files in your project folder first, then import them in Keil.

Always check that all the source files are included in the project folder of the assignment before delivering it. If some files are missing, the project **will not compile on our computers** and you won't get any points for your project.

The zip file should be named “extrapoint2.zip”. Please use this exact name for the zipped folder and avoid exotic filenames such as: Extrapoint1.zip, extra_point_2.zip, pointextra.rar, Progetto2.tar.gz, tetris2.7z, or extrapoint2_name_surname_999456_final_definitive_version_ishouldhavelearnedtousegit_v4.20.zip.

Very Important DISCLAIMER: The use of AI is not forbidden neither strongly suggested. However, we are going to check the usage of AI in your project, and assign the score accordingly between you and the AI (i.e., if the AI wrote the 70% of the code, you will get only 30% of the total score).

Remember that AI agents will NOT be available during the exam 😊.

Additional Comments for the use of AI (If you did not use it, leave it empty):

Did I use the AI?

Am I going to be prepared for the exam either way?

What did I use? Gemini, Copilot, etc.

Which version did I use?

What did I use the AI for?

- First task
- Second task
- ...

Please add also a brief description in the video on the parts in which you used AI.

Specifications (extrapoint 2)

You must **extend** the Tetris game you have created for Extrapoint 1, adding new functionalities, meaning that **the project for Extrapoint 2 must respect the same specifications listed in Extrapoint 1, plus the new ones.**

Spec. 1) **Speed** – Use the potentiometer to set the game speed. From 1 square/second (ADC samples 0 V) to 5 squares/second (ADC samples the maximum voltage level). Remember to handle the soft drop mechanic correctly: in extrapoint 1, holding the joystick down increases the speed to 2 squares/second. In this case, holding the joystick down doubles the current falling speed instead of setting it to 2.

Spec. 2) **Powerups** – The game should spawn powerups during the game. Every 5 clear lines, a random powerup will substitute a block that is already on the playing field (i.e., it should not appear in an empty spot) and should be drawn in a way that distinguishes it from normal blocks and other powerups. The powerup effect activates when clearing the line that contains it.

The powerups to implement are:

- **Clear half the lines:** the bottom half of the lines are instantly cleared from the playing field, awarding the appropriate number of points as if the player effectively cleared those lines. If the powerup clears up to 4 lines, award the usual number of points. If more than 4 lines are cleared, award the points in groups of 4 lines (remember that unless the number of cleared lines is a multiple of 4, the last group will contain less than 4 lines, so handle that case appropriately).
If there are no remaining lines after activating the powerup, nothing happens and no points are awarded.
- **Slow down** - If the current game speed is higher than 1 square/second, this powerup slows down the game to 1 square/second for 15 seconds. After 15 seconds, the game speed returns to normal.

Spec. 3) **Random malus** – To increase the difficulty of the game, every 10 cleared lines, a line appears at the bottom of the screen (shifting the rest of the lines up by 1 line) where 7 random spaces out of 10 contain a block (i.e., the 7 blocks are not placed sequentially, there may be holes in the line). If the new line makes the other lines overflow the top boundary of the playing field, the game is lost.

Spec. 4) **Music** - Configure the **speaker** to play sound effects and background music. This last part cannot be implemented on the emulator.