Dynamics

Link to HachMd(in case of some additions, better to check by link, instead of file):
https://hackmd.io/NZAhyrBCQn6hcgdhhb6LPg?both

- Main Task: **Gripper mechanism for lifting bricks**
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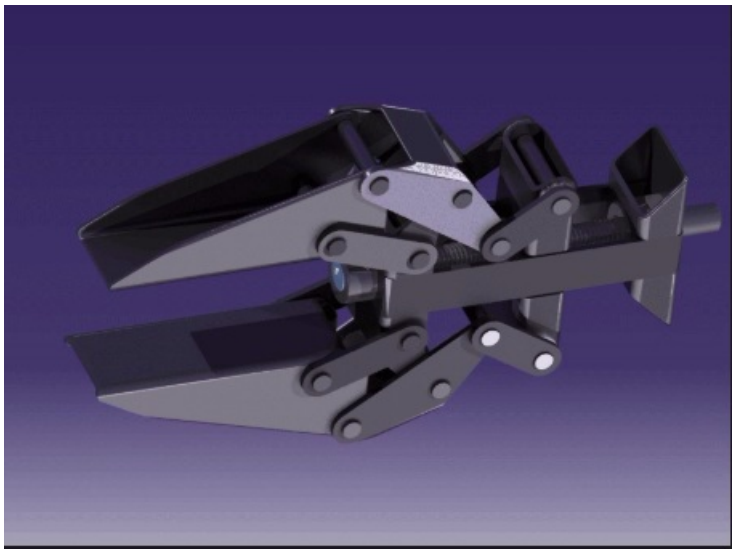
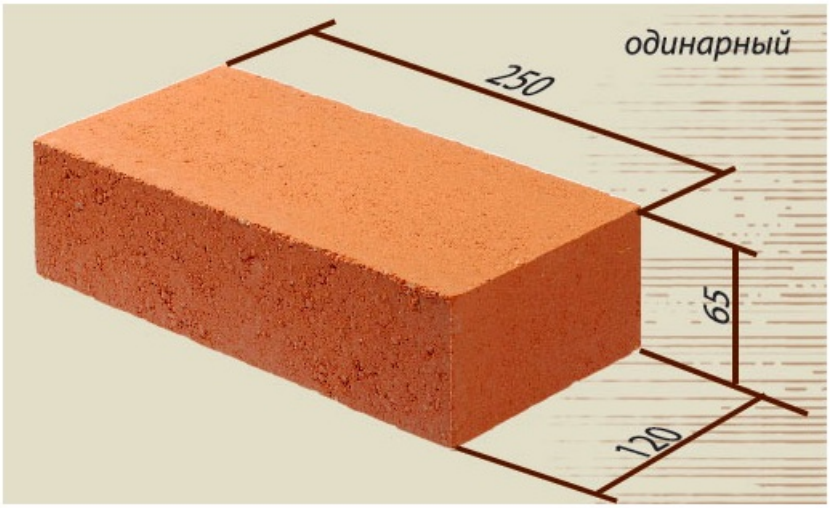
Gripper



Brick

“В Советском Союзе в 1925 г. был зафиксирован стандартный размер кирпича: 250x120x65мм. Вес кирпича керамического не должен превышать 4,3кг”



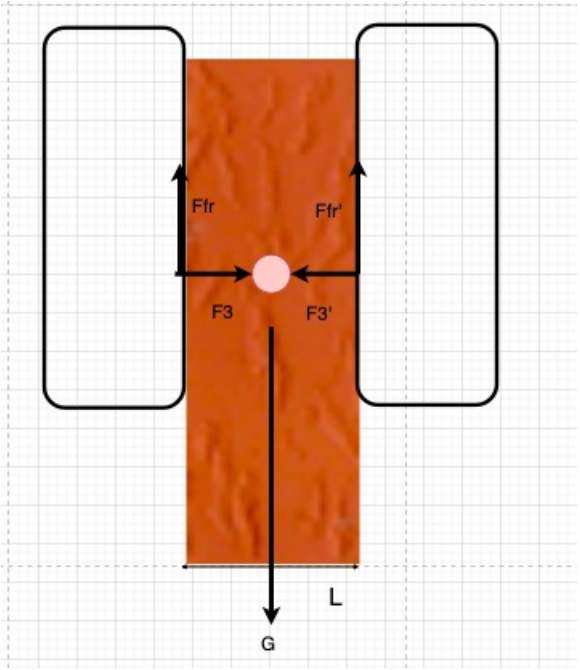
- as a task for next iteration, we will find exactly that brick
- we think, that we want to pick the brick from the side = 120mm
- by the mass we consider m = 2-2,3kg as Internet said us “кирпич щелевой (пустотелый) одинарный размером 250x120x65 мм. весит 2 -2,3 кг.”

But until real brick we can assume that needed lenght to grab is L.

Dynamic Part:

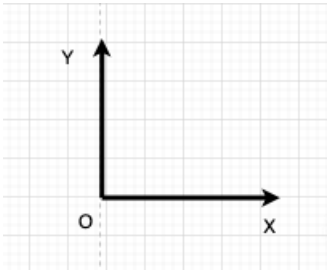
- We consider no inertial effects, since link movements are slow.
- And also we not bring in our consideration masses of links, because there sum much smaller than our brick.
- Yes, of course all forces is a vectors on picture, but it was a bit dificult to do, so we can take it in mind.
- Not using direction for vectors(but all forces there-vectors)
- For know we don’t know to which place the grabbers will go, and just not to make a mistake we put the forces upper than center of the brick.

We can see, that for now for us our dynamics it goes to static one:



Our object to research know is brick and so we look at all forces that will influence on it.

Statics part



Sum of all forces on X direction: $oX: -F_{'3} + F_3 = 0$, so $F_{'3} = F_3$

Sum of all forces on Y direction: $oY: F_{fr} + F_{fr'} - G = 0$ where G = m*g g = 9,81 m/s^2.

Sum of moments around the center of the brick: $F_{'3} * y_3 - F_3 * y_3 - F_{fr} * L/2 + F_{'fr} * L/2 = 0$, so $F_{fr} = F_{'fr}$

Hence:

$F_{fr} = mg2 = \mu * F_3$

$F_3 = mg2 * \mu$ where m - mass of our brick.

Need to know μ to determine needed force.
For common materials:

- wood on brick $\mu = 0.6$
- carton on brick $\mu = 0.65$
- 3d printer plastic on brick $\mu = unknown$

So, need to be determined experimentally.

Next, we know that from brick side on grabbers exists force N, which is opposite direction and equal size, so that $N = mg2 * \mu$ for each of 2 grabbers.

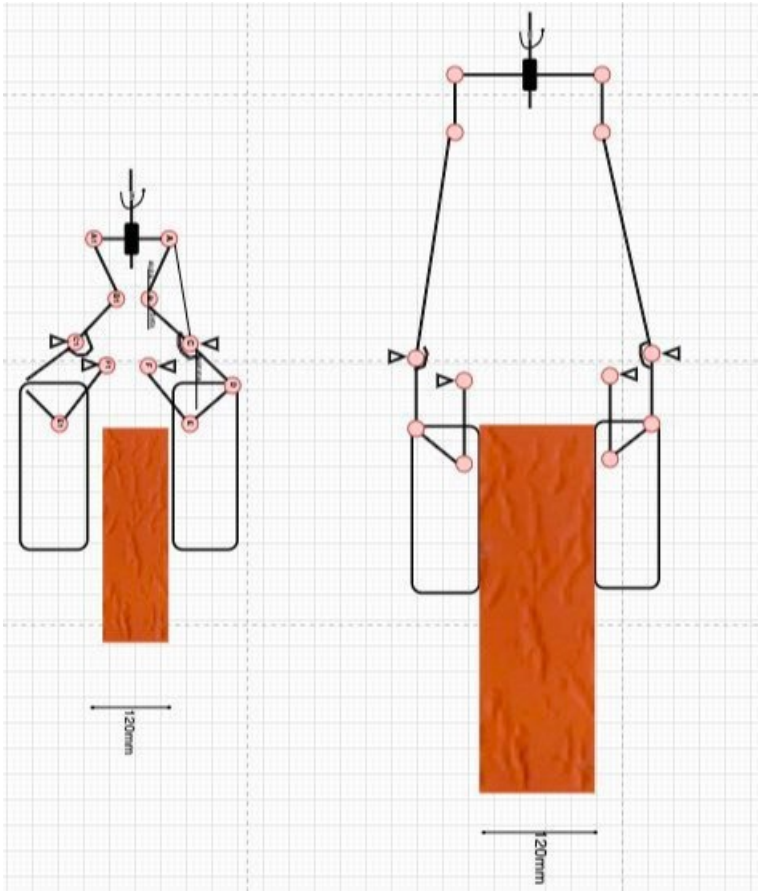
So, now we know force N => using the principle of possible movements we can calculate the relationship between the force on the grabbers and the moment on the shaft.

To think that without stopping the engine, the mechanism continues to move and how

In order for our mechanism to move without stopping, which means that it is seized and released, but we are not required to have such a function on assignment, although we could do this by controlling the motor, which would change its direction each time after the brick was captured. You can also think that this mechanism can be used without a motor, simply by adding a button to one of its sides, when clicked, the gripper would collapse, which means it would grab a brick.

Stopping conditions for our gripper

We know, that we need to stop our motor, when the brick will be between the grabbers, so one of the

our stopping conditions can be 

xE=xF

We think, that we want to grab the brick on it medium so eX=L/2

References

Friction Coefficient for brick: https://mnogoformul.ru/kak-nayti-koyefficient-treniya