Classroom Document Reader

A laptop connected document reader that allows user to write on A-4 size paper and a camera that records it.

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Major: Computer Science

Classification: Senior

Client: Abdullah Bajwa

Users: Online Teachers

Problem Definition:

1. List of Objectives:
    a. Portability: Reader should be portable.
    b. Adjustability: Reader should be allow user to able to adjust camera height.
    c. Turn-ability: The camera arm should be swivel-able. (Bonus Feature)
    d. Manufacturability: The machine assembly should be easy to manufacture.
2. List of Constraints:
    a. Camera Visibility: Legs should not be visible in camera view.
    b. Writing Hindrance: There should be no hindrance in writing/drawing.
    c. Paper Movability: Paper should not move while writing.
    d. Affordability: Elements should not be very expensive.

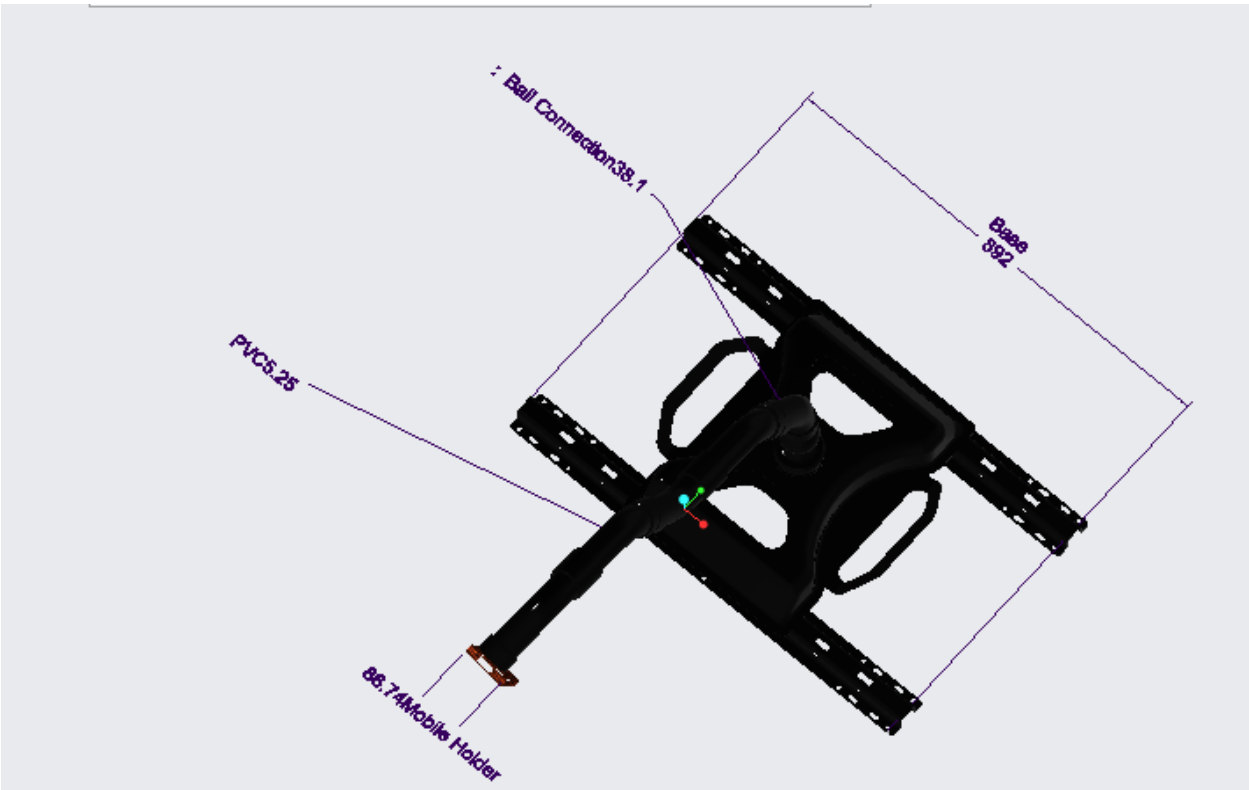
Pairwise Comparison Chart:

	Portability	**Adjustability**	**Turn-ability**	**Manufacturability**	**Score**	**Scaled Score (Adding 1 to all scores to remove any zeros)**
Portability	--	0	1	0	**1**	**1 + 1 = 2**
Adjustability	1	--	1	0	**2**	**2 + 1 = 3**
Turn-ability	0	0	--	0	**0**	**0 + 1 = 1**
Manufacturability	1	1	1	--	**3**	**3 + 1 = 4**

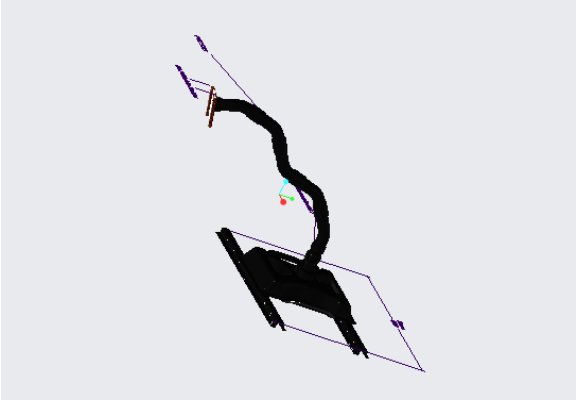
Design Scheme Sketches/Pictures:

Design 1:

Flexible Gooseneck arm camera holder to be used with a desk for writing.



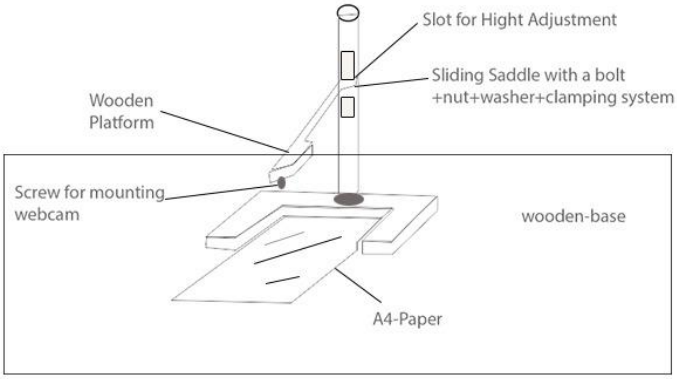
1.1: Top view



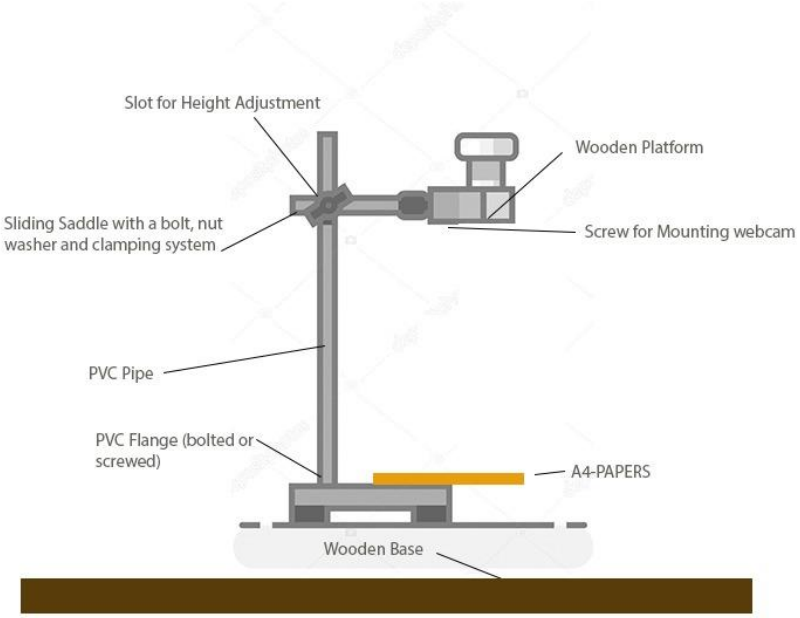
1.2: Side View

Design 2:

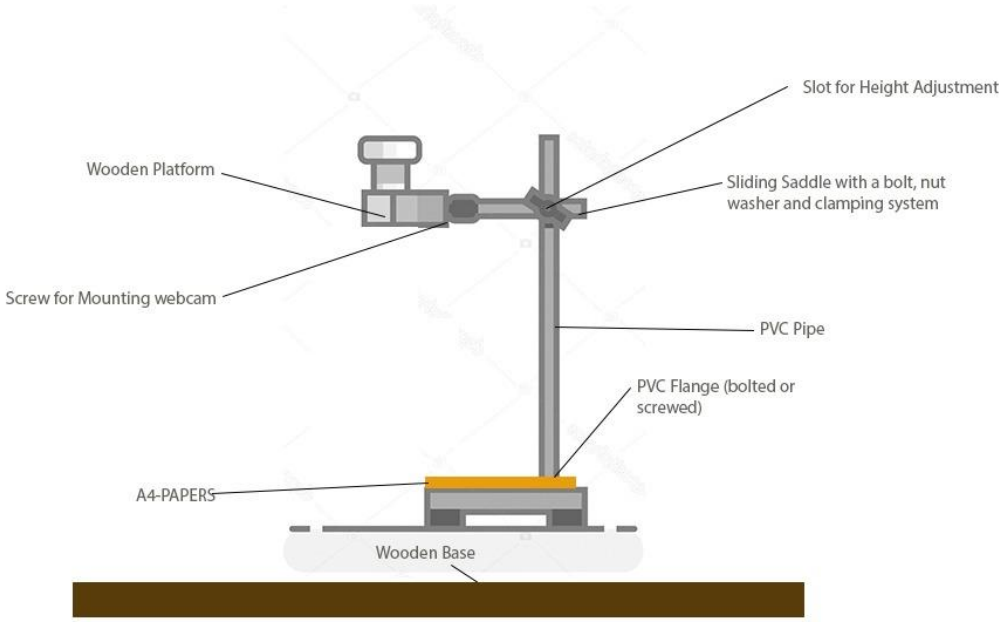
180 degree movable arm for camera with fixed paper holder.



1.3: Front view



1.4: Colorized for illustrative purposes



1.5: Left perspective

Metrics:[1]

Objective	Metric Score Measure
Portability	0 – Cannot be moved from its place
	25 – Cannot be moved by one person
	50 – Cannot be placed inside car
	75 – Can be moved but requires a lot of space to set up.
	100 – Can be easily moved and does not require much space.
Adjustability	0 – Camera height is fixed
	25 – Camera height can only be changed through screws.
	50 – Camera height can be changed but only legs appear at other heights.
	75 – Camera height can be adjusted and legs only appear at a certain height (highest point)

[1] **Note: All of the metrics are qualitative instead of quantitative since one of the designs is not being made in Creo so we cannot be sure of its weight or load capacity etc. All metrics are already in the range of 0 to 100 so there is no need to scale them.*

	100 – Camera height can be easily adjusted without any other problems.
Turn-ability	0 – Camera holder cannot turn to show face.
	25 – Camera holder only moves at an angle of 25 degree.
	50 – Camera holder only moves at an angle of 50 degree.
	75 - Camera holder only moves at an angle of 75 degrees.
	100 – Camera holder can move up to 90 degree.
Manufacturability	0 - Parts cannot be manufactured
	25 – Parts can only be manufactured outside Pakistan at very high costs.
	50 – Parts can only be manufactured outside Pakistan at low cost.
	75 – Parts can be manufactured within Pakistan at high cost.
	100 – Parts can easily be manufactured in Pakistan at low cost.

Unscaled Metric Scores:

Metric	Design 1 Score	Design 2 Score
Portability	100	100
Adjustability	100	75
Turn-ability	100	100
Manufacturability	100	100

Decision Making Matrix:

Constraints	Design 1	Design 2
Camera Visibility	Satisfied	Satisfied
Writing Hindrance	Satisfied	Not Satisfied
Paper Movability	Satisfied	Satisfied
Affordability	Satisfied	Satisfied
Score (out of 4):	**4**	**3**
Design Objectives (more to least Important)	**PCC Scores**	**Metric Scores (Scaled between 0 and 100) PCC scores not factored in**

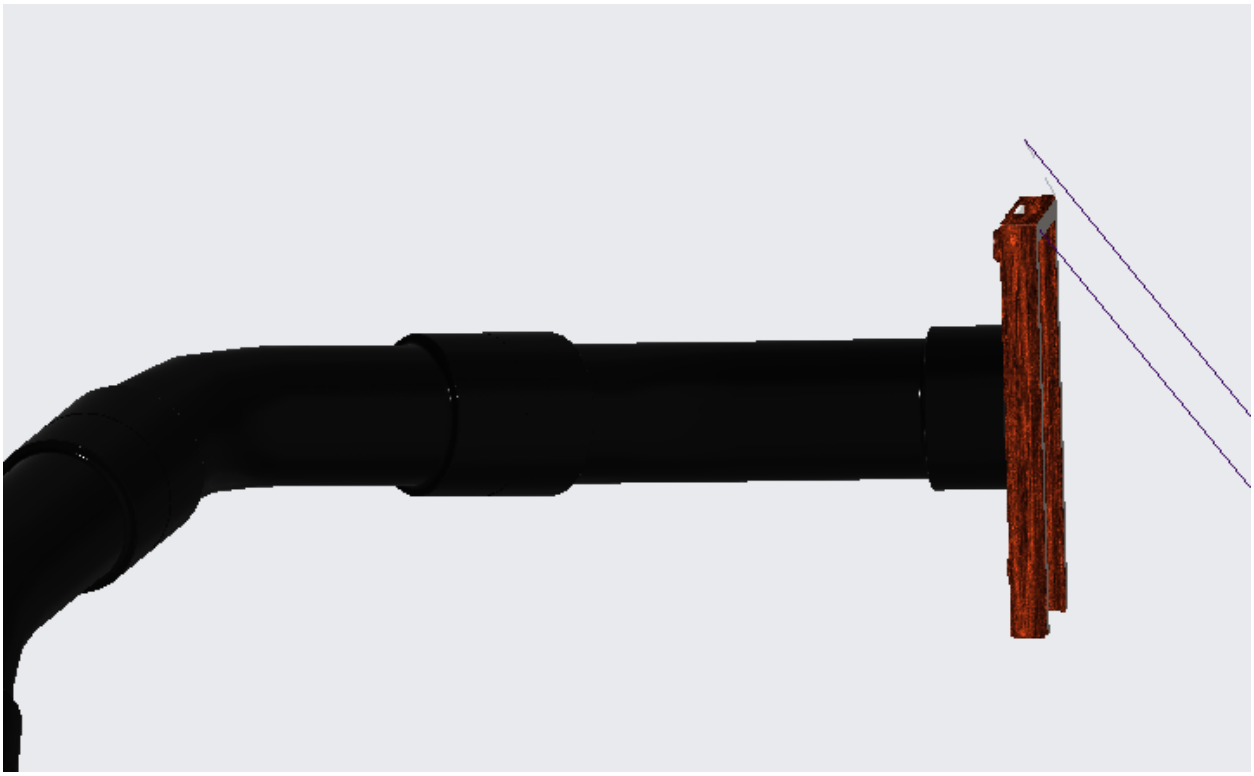
Manufacturability	3	100	100
Adjustability	2	100	75
Portability	1	100	100
Turn-ability	0	100	100
Design Objectives (more to least Important)	**Scaled PCC Scores**	**Metric Scores (Scaled between 0 and 100) PCC scores factored in by multiplying metric scores by their respective Scaled PCC scores**	
Manufacturability	$\frac{4}{4+3+2+1} = 0.4$	100 x 0.4 = 40	100 x 0.4 = 40
Adjustability	$\frac{3}{4+3+2+1} = 0.3$	100 x 0.3 = 30	75 x 0.3 = 22.5
Portability	$\frac{2}{4+3+2+1} = 0.2$	100 x 0.2 = 20	100 x 0.2 = 20
Turn-ability	$\frac{1}{4+3+2+1} = 0.1$	100 x 0.1 = 10	100 x 0.1 = 10
Total Score:		**100**	**92.5**

Verdict:

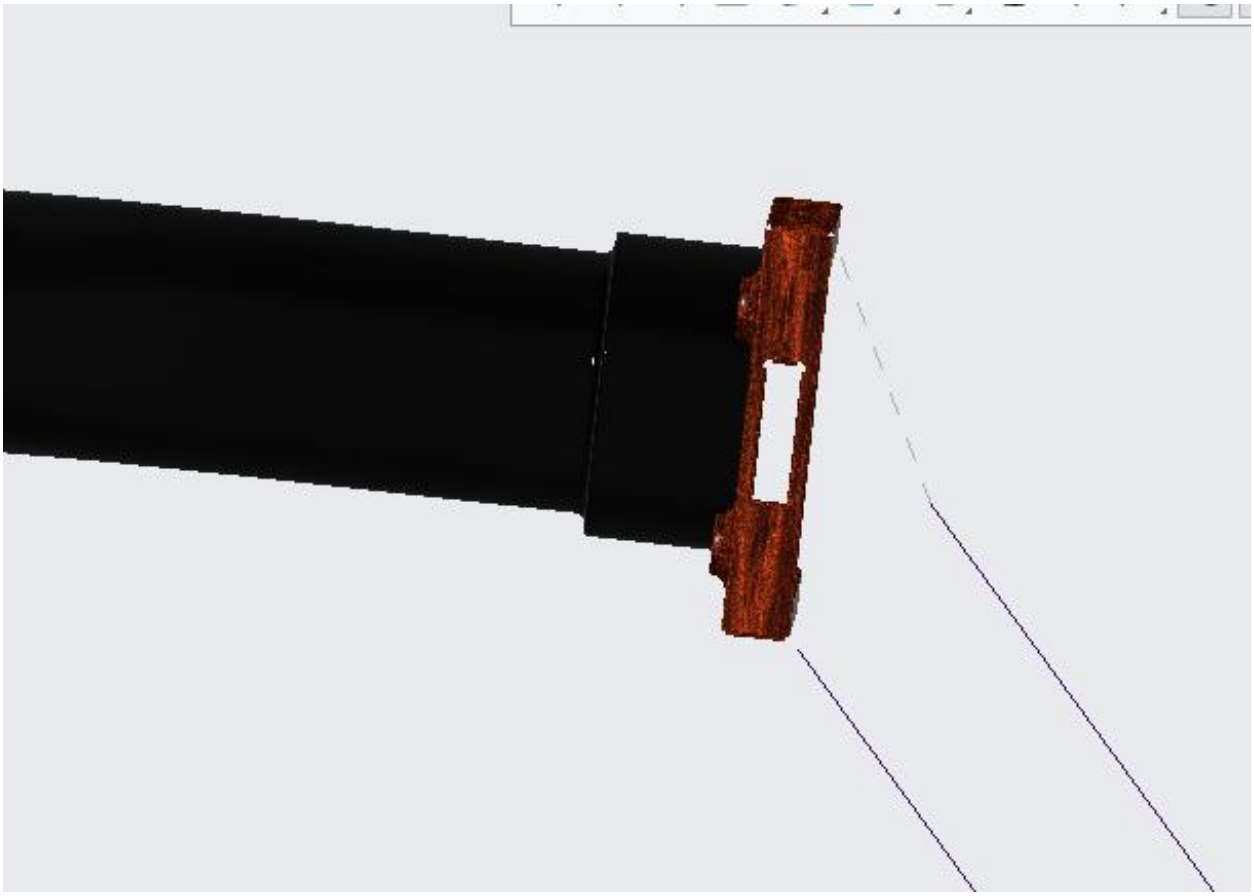
Design 1 is better because it has a better overall score of 100 as compared to design 2's overall score i.e. 92.5.

Winning Design:

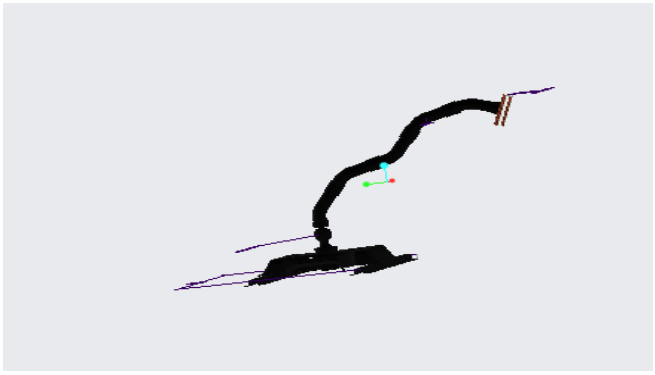
Showing Images for Design 1



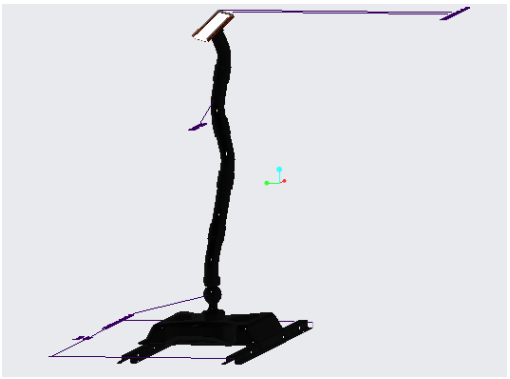
3.1: Phone Attached Vertically



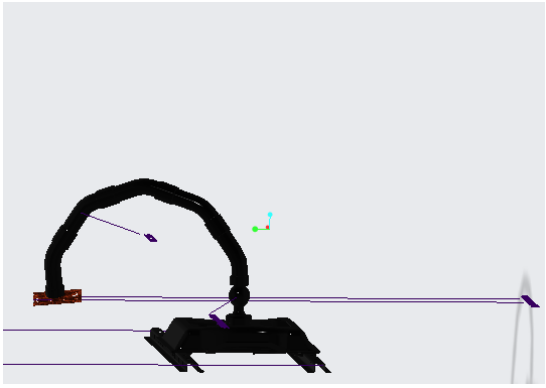
3.2: Phone attached horizontally



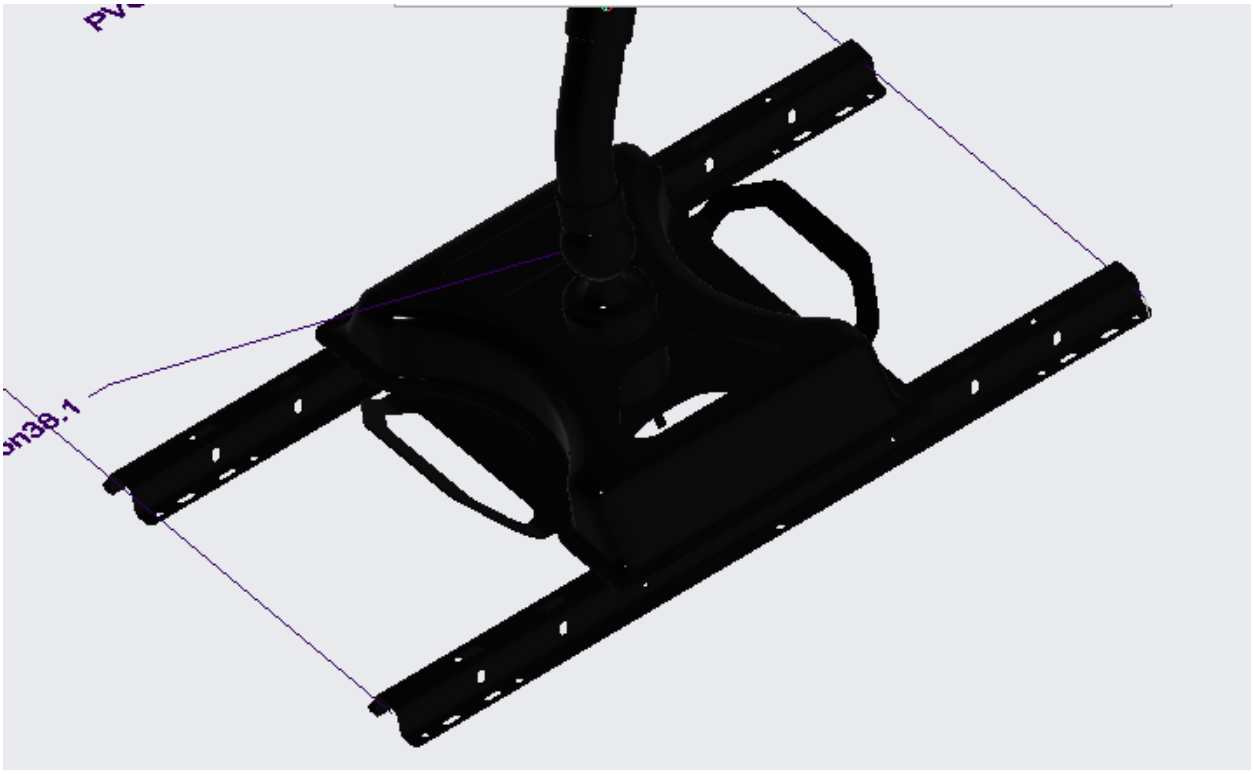
3.3: Reader facing right



3.4: Reader placed straight



3.5: Reader bent downwards



3.6: Base of the reader