Updates

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Proposed Update 1

We have seen the final results of the project and there, the relative weighting of the different input channels shows us that the luminance and the color information are the most reliable for tracking of head and the motion information is the least reliable. Probably because it will be relatively difficult to distinguish in the frame difference images the head from other moving body parts. The suggestion is that we can remove the D component of the image and then move on with only Y, U, and V component, as it will not make much difference.

- **Why is it better in performance than the one presented in the paper?**

This method will decrease the memory used and the computing power. No Doubt, D component is increasing the performance but it also gives us an extra variable in each step of the computation, which will increase the computing power, and each variable will be using some memory too.

Proposed Update 2

We have used a sigmoidal function (tanh(x)) in the model but nowadays it is not used much. Instead, we can use ReLu activation function which stands for Rectified Linear Unit. It is motivated by biological analogy that neurons would be activated if input passes a certain threshold.

- **Why is it better in performance than the one presented in the paper?**

Tanh(x) is facing vanishing gradient problem. This problem mostly occur during backpropagation when the value of the weights are changed. To understand the problem we will increase the value of the input values in the activation function, at that time we will notice that the predicted output is available on the range of the selected activation function and maintain the threshold value.

For the sigmoid function, the range is from 0 to 1. We know that the maximum threshold value is 1 and the minimum value is 0. So when we increase the input values, the predicted output must lie near to the upper threshold value which is 1. Therefore, the predicted output must be less than or near to the 1.

We again increasing the input value and the output comes on the max threshold value and lies there. When the neuron outputs are very small for example (−1<output<1), the patterns are created during the optimization will be smaller and smaller towards the upper layers. This causes them to make the learning process very slow, and make them converge to their optimum and this problem is known as the Vanishing Gradient Problem.

In ReLu function:

i. All the negative values are converted into 0 so there are no negative values available.

ii. Maximum Threshold values are Infinity, so there is no issue of Vanishing Gradient problem so the output prediction accuracy and there efficiency is maximum.

iii. Speed is fast compare to other activation function.

Activation function	Sigmoid	Tanh	ReLu
Range	0 to 1	-1 to 1	0 to infinity
Vanishing gradient problem	Yes	Yes	No
Equation	Y=1/(1+e^(-x))	Y = tanh(x)	xi if x >= 0 0 if x < 0
Model accuracy	Good	Very good	Excellent

Table: Differentiation between Sigmoid, Tanh, and ReLu

References used:

1. https://youtu.be/aircAruvnKk
2. Activation Functions: Sigmoid, Tanh, ReLU, Leaky ReLU, Softmax | by Mukesh Chaudhary | Medium
3. Comparison of Sigmoid, Tanh and ReLU Activation Functions - AITUDE