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### ABSTRACTS

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**THE CONVEX COMBINATIONS OF QUADRATIC OPERATORS ON  $S^3$**

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Quadratic operators across the attention of specialists in various fields of mathematics and its applications [see, for example, [1], [2], [3]]. We will use the definition and notations of the reference [4]. In [5] on the two-dimensional simplex the following quadratic stochastic operator was studied:  $V_3 : S^2 \rightarrow S^2$ ,  $V_3(x_1, x_2, x_3) = (x_1^2, x_2^2, x_3^2)$ , where

$$x_1^2 = x_1^2 + 2x_1x_2, \quad x_2^2 = x_2^2 + 2x_1x_3, \quad x_3^2 = x_3^2 + 2x_2x_3.$$

It is proved that  $M_1(1, 0, 0)$ ,  $M_2(0, 1, 0)$ ,  $M_3(0, 0, 1)$ ,  $C(1/3, 1/3, 1/3)$  are fixed points of the operator  $V_3$ .

Note that in [6] by analogy with the following quadratic stochastic operator  $V_4$ :

$$V_4 : \begin{cases} x_1^2 = 1/3x_1^2 + 1/3x_2^2 + 1/3x_3^2 + 2x_1x_2 \\ x_2^2 = 1/3x_1^2 + 1/3x_2^2 + 1/3x_3^2 + 2x_1x_3 \\ x_3^2 = 1/3x_1^2 + 1/3x_2^2 + 1/3x_3^2 + 2x_2x_3 \end{cases}$$

It is proved that the operator  $V_4$  has a unique fixed point  $C$  and it is a regular operator. In present paper, we shall consider a convex combination of the operators  $V_3$  and  $V_4$

$$V_\lambda : S^2 \rightarrow S^2, \quad V_\lambda = (1 - \lambda)V_3 + \lambda V_4, \quad (\lambda \in \Delta, \lambda \in I).$$

It is easy to see that the operator  $V_\lambda$  has the form:

$$V_\lambda : \begin{cases} x_1^2 = (1 - 2\lambda/3)x_1^2 + \lambda/3x_2^2 + \lambda/3x_3^2 + 2\lambda x_1x_2 \\ x_2^2 = \lambda/3x_1^2 + (1 - 2\lambda/3)x_2^2 + \lambda/3x_3^2 + 2\lambda x_1x_3 \\ x_3^2 = \lambda/3x_1^2 + \lambda/3x_2^2 + (1 - 2\lambda/3)x_3^2 + 2\lambda x_2x_3 \end{cases}$$

Obviously, the operator  $V_\lambda$  is also a quadratic stochastic operator.

**Theorem.** For the operator  $V_\lambda$  the following statements are true:

- a) The operator  $V_\lambda$  has a unique fixed point  $C(1/3, 1/3, 1/3)$ ;
- b) if  $\lambda = (3 - \sqrt{6})/2$  then the fixed point  $C$  is a non-hyperbolic point;
- c) if  $0 < \lambda < (3 - \sqrt{6})/2$  then the fixed point  $C$  is a repelling point;
- d) if  $(3 - \sqrt{6})/2 < \lambda < 1$  then  $C$  is an attracting point.

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