عنوان مقاله:

fault diagnosis of internal combustion engine valve train based on hypothesis tests

محل انتشار:

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خلاصه مقاله:

Internal combustion engine noise has oriented from several sources. The reciprocating mass-es are one of them. Pistons, valves and injectors are most familiar ones. Valves are small mass compared to pistons but their impact noise at the beginning and end of the lift duration made them as one of the noise sources especially at engine idle speed. Moreover, the valve lift deviation from designed curve has a strong influence on engine performance. The valve operation can be monitored through studying of emitted noise. Analyzing of this noise shows valves opening and closing which is helps for valve train fault diagnosis. For rigid tappets, if these events detect properly, the valve operation will be estimated.This paper introduces a new method based on hypothesis test to detect the opening and clos-ing events of the valves. Most of engine events are match to a specific crank angle, so; ac-quired signal from engine cylinder head resample to the crank angle axis and partitioned into the determined length (windowing). Each window may be consisting of engine noise only (Null Hypothesis) or engine noise plus valve-induced vibration (Alternative Hypothesis). Therefore, the problem of finding valve event timing is stated as finding that which one of mentioned hypothesis is best choice for the desired window. For each window, a representa-tive called sufficient statistics is calculated from samples lie on it. This value will compare to a threshold, which is results of multiplying of the estimated noise power and a gain. The gain is calculated using Neyman-Pearson decision rule to reach a specific false alarm rate. Noise power must be estimated carefully. If noise power underestimated, false alarm rate is bigger than the desired value. Otherwise, overestimated noise power can make several prob-lems too. Missing of true events is a consequent of overestimating.

کلمات کلیدی:

fault diagnosis; engine valve train; Neyman-Pearson decision rule; hypothesis tests