Electronic Supplementary Information

DNA-based visual majority logic gates with one-vote veto function

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Table S1. Sequences of the oligonucleotides used in this work. The sequences formed G-quadruplex are colored in red.

Name	Sequence
P1	5'-ACGAACATCG GGGTGGG CTACAACGAC-3'
P2	5'-AACGATAGTC GGGTGGG AGTGACGCAC-3'
P3	5'-AATCCGCGAA GGGTGGG TACTGAATGT-3'
IN1	5'-GGG CGATGTTCGT ACATTCAGTA GGG-3'
IN2	5'-GGG GACTATCGTT GTCGTTGTAG GGG-3'
IN3	5'-GGG TTCGCGGATT GTGCGTCACT GGG-3'

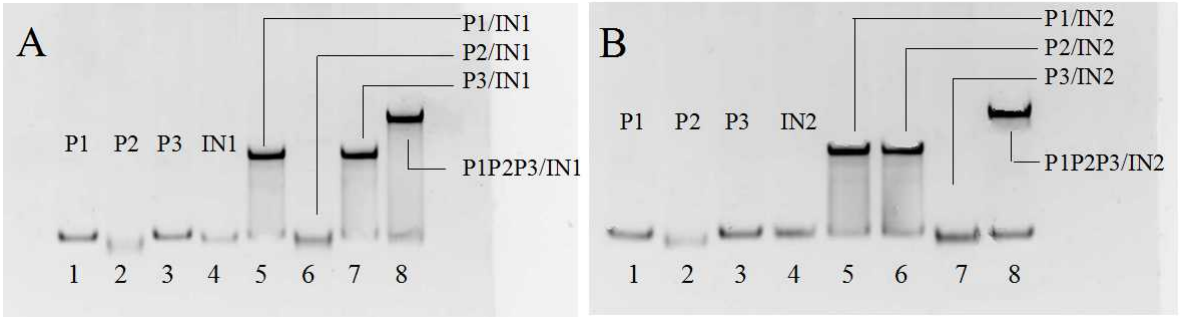

Fig. S1 15% native polyacrylamide gel analysis of the interaction between one input DNA strand and the platform DNA strands, P1, P2 and P3. (A) Interaction between IN1 and the platform DNA strands, P1, P2 and P3. Lane 1: P1, Lane 2: P2, Lane 3: P3, Lane 4: IN1, Lane 5: P1+ IN1, Lane 6: P2+IN1, Lane 7: P3+IN1, Lane 8: addition of IN1 into the platform containing P1, P2 and P3. (B) Interaction between IN2 and the platform DNA strands, P1, P2 and P3. Lane 1: P1, Lane 2: P2, Lane 3: P3, Lane 4: IN2, Lane 5: P1+ IN2, Lane 6: P2+IN2, Lane 7: P3+IN2, Lane 8: addition of IN2 into the platform containing P1, P2 and P3.

As shown in Fig. S1 A, the DNA band of P1, P2, P3 and IN1 appears at a similar position from Lane 1 to Lane 4. After adding IN1 into P1 or P3, new bands appeared in Lane 5 and Lane 7, respectively, indicating the duplex formation of P1/IN1 and P3/IN1. After adding IN1 into P2, no new band appears in Lane 6, suggesting no hybridization between IN1 and P2. As shown in Figure S1B, the DNA band of P1, P2, P3 and IN2 appears at a similar position from Lane 1 to Lane 4. After adding IN2 into P1 or P2, new bands appeared in Lane 5 and Lane 6, respectively, indicating the duplex formation of P1/IN2 and P2/IN2. After adding IN2 into P3, no new band appears in Lane 7, suggesting no hybridization between IN2 and P3.

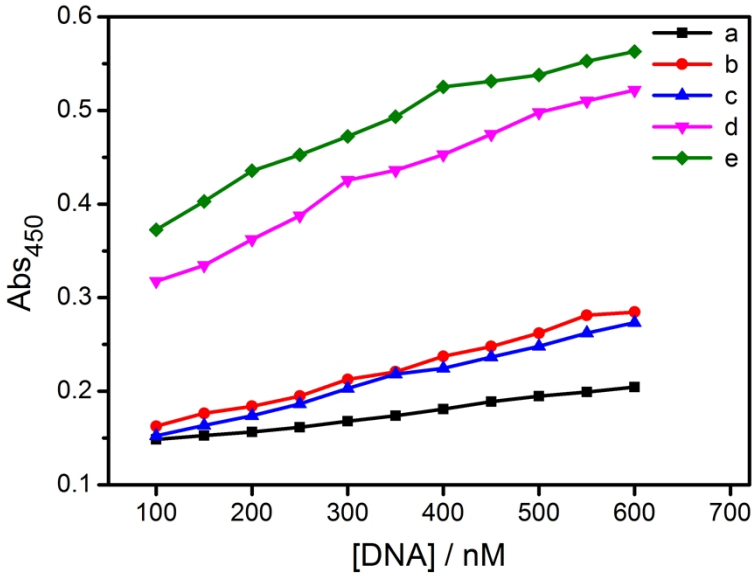

Fig. S2 The UV-vis absorbance intensity at 450 nm against different concentration of DNA, IN1 (a), IN2 (b) and IN3 (c), in the presence of each platform DNA (300 nM). And UV-vis absorbance intensity at 450 nm of different concentration of IN1 (d), IN3 (e) in the presence of each platform DNA (300 nM) and IN2 (300 nM).

Here, we first fixed the concentration of 300 nM for each of the platform DNA. The absorbance of the solution at 450 nm was monitored by changing concentration of the input. The absorbance intensity of the system generally increases with increasing concentration of each input, IN1 (a), IN2 (b) and IN3 (c). The absorbance intensity in the presence of IN2 is higher than the other two inputs, in a three-input majority logic gate, the system should present high output when more than half of the inputs are added. Here, the concentration of IN2 was selected as 300 nM to optimize the concentration of the other two inputs. The absorbance intensity of the system increases with increasing the concentration of IN1 (d) and IN3 (e). For the purpose of making the logic function more flexible and in consideration of reducing the experiment cost, we finally choose the concentration of IN1, IN2 and IN3 as 350 nM, 300 nM and 300 nM, respectively.

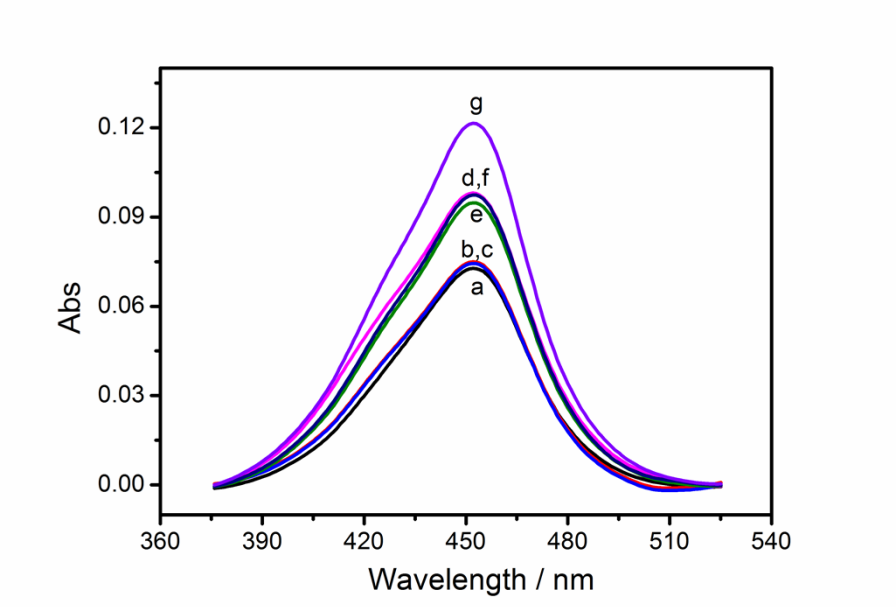

Fig.S3 UV-vis absorbance curves of IN1 (a), IN2 (b), IN3 (c), IN1+IN2 (d), IN2+IN3 (e), IN1+IN3 (f), IN1+IN2+IN3 (g) in the absence of all platform DNA.

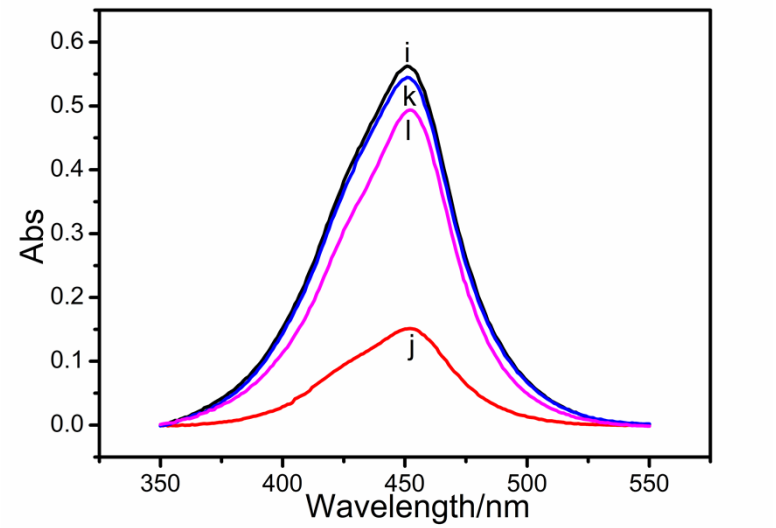

Fig.S4 UV-vis absorbance curves of IN1+IN2+IN3 (i), IN1+IN2+IN3+Cu^{2+} (j), P+IN1+IN2+IN3+EDTA (k) and P+ IN1+IN2+IN3+Cu^{2+}+EDTA (l) in the presence of platform DNA.